ECONOMIC GEOGRAPHY OF INDIA

(INCLUDING PAKISTAN, CEYLON & BURMA)

BY

A. DASGUPTA

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BY

A. DASGUPTA

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WITH MAPS AND DIAGRAMS

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PREFACE TO THE SIXTH EDITION

Economic Geography of India has been written on two beliefs about which I want to be explicit. The purpose of the study of Economic Geography has been to contribute towards understanding the distribution of economic resources of the various countries of the world and their utilisation. Naturally, the subject must mainly cover production, transportation and commerce of a country. Secondly, it is not essential that a student of commerce should proceed to study the subject with the knowledge of Physical Geography though such a knowledge may help him to understand geographical explanations more readily. Economic Geography so far as commerce courses are concerned can be treated as a distinct subject.

I have treated Economic Geography of India as the geography of our economy. Rapid and far-reaching changes have been taking place in India's developing economy. In one sense, the subject is an inquiry to find out to what extent the economy of India is conditioned by her inhabitants and their character, and the environment. In so doing, one will realise the significance of the colossal task, undertaken by the Government and the people through a series of plans, to increase production in all areas, and promote commerce and trade.

The design of the book has been developed through many years of experience in teaching the subject to commerce students. It is so designed that it may also be used where orientation is to be given on the subject.

The present edition of the book represents a very thoroughgoing revision ; the book has been largely re-written. There are complete and up-to-date facts and figures about various geo-economic aspects.

My grateful thanks are to Professor S. P. Chatterjee of the University of Calcutta, an eminent geographer, whose comments and criticisms have always stimulated my thinking.

University of Delhi A. DASGUPTA

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CHAPTER I

PHYSICAL ENVIRONMENT

LOCATION: AREA: COAST

In respect of size, India is the seventh gigantic state in the world, being preceded by the U.S.S.R., China, Canada, Brazil, the U.S.A. and Australia. The Republic of India measures 2,000 miles from north to south and 1,850 miles from east to west and presents the form of a somewhat irregular equilateral triangle. The Republic has 12,69,838 square miles of area with 434 million population including Kashmir. Administratively, the Republic consists of 16 States which are federating units and eight territories which are centrally administered. The States are Maharashtra, Gujarat, Madhya Pradesh, Rajasthan, Uttar Pradesh, Andhra Pradesh, Assam, Mysore, Bihar, Orissa, Madras, Punjab, West Bengal, Kerala, Jammu and Kashmir and Nagaland. The Union territories are Himachal Pradesh, Manipur, Tripura, Delhi, the Andaman and Nicobar islands, the Laccadive, Minicoy and Amindivi Islands, Dadra and Nagar Haveli and Goa, Daman and Diu.*

In determining the number and size of States in India, the following factors have been taken into consideration:

(*i*) Preservation and strengthening of the unity and security of India;

(*ii*) Creation of linguistic and cultural homogeneity;

(*iii*) Compliance with financial, economic and administrative requirements; and

(*iv*) Implementation of the National Plans for economic development and welfare activities.

* At the time when India attained political independence in 1947, there were many provinces and more than 700 Indian States. By 1956, the number was reduced to 20 political units—14 States and 6 centrally administered areas. In 1960, the State of Bombay was divided into the States of Maharastra and Gujarat. Nagaland has been given the status of State in 1961. Goa, Daman and Diu which were liberated from Portuguese occupation in December, 1961, are being administered as Union territories.

Thus, in each State people have common interests in regard to languages, customs and aspirations. Adjustment of interests to eliminate social frictions—wherever they exist, is taking place.

All the same, there has been so *much cross fertilization* of ideas and customs among the people of India that narrow concepts of isolation are hardly found anywhere.

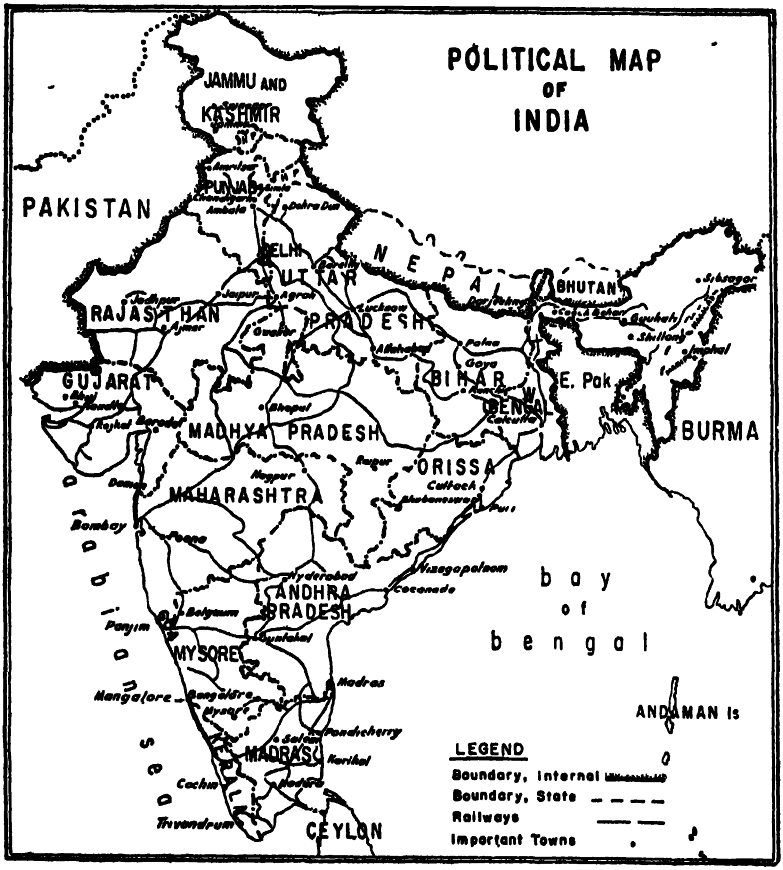


FIG. 1. The Political Map of India showing the different States and the important towns.

India has both natural and artificial boundaries. The natural frontier consists of the Himalayas on the north, the Arabian sea on the south-west and the Indian Ocean on the south. In the west, the Indo-Pakistan border is open and

follows the upper course of the Ravi in Amritsar district and then turning southward the boundary follows the Sutlej in Ferozepur district. From Ferozepur the boundary of the Republic coincides with the western limits of Rajasthan. Assam forms the eastern-most boundary of India. It touches Tibet in the north, East Pakistan in the south-west, China in the north-east and Burma in the east. About three-fourths of India's boundaries are mountains and seas and are, therefore, well-suited to defence.

Being marked off from the rest of Asia by mountains, deserts and seas, India has a distinct geographical entity. Also, she occupies a highly favourable situation for the purposes of international commerce. She stands almost at the centre of the Eastern Hemisphere and at the head of the Indian Ocean. She commands all the sea routes for trade between the old and the new worlds—towards Africa and Europe in the west, Australia in the south—Thailand, China, Japan and America in the east. India can rightly boast of possessing "natural frontiers", shut off, as she is, by the Himalayas on the north, by the Arabian Sea on the south-west and by the Indian Ocean on the south. Thus, the geographical location of the Indian Republic is a factor of great importance affecting her commerce, defence and climate. Her location between the densely populated areas of Burma, Malaya, Indonesia and Thailand on the east and the industrially underdeveloped Middle East can make her one of the greatest commercial nations of the future.

India has a coast-line of 3,500 miles, which gives one mile of coast to every 400 square miles of area. The coast-line of India, in spite of its great length, is broken by only a small number of inlets and possesses a few islands round it. The continental shelf of the country is shallow and the shores are usually flat and sandy. Because of these physical characteristics India possesses only a few ports and harbours in proportion to her coast-line. The Gulf of Cutch, the Gulf of Cambay, the backwaters of Cochin and Malabar, the Palk Strait and the Gulf of Mannar, and the indentations at the mouths of the Ganga are the inlets and straits of India. These are all shallow with the exception of the *backwater* of Cochin and Malabar and permit navigation when they are made deep by dredging operations.

The east coast of India runs from the mouth of Kalindi in Khulna on the border of East Pakistan along the Sundarbáns in a westerly direction, to the Hugli river. From the Hugli, the coast proceeds south-west to the Kistna Delta, from where it continues south to Cape Comorin which is the southernmost point of India. *The west coast* runs from Cape Comorin. The coast runs north to the Gulf of Cambay, where the Kathiawar Peninsula juts out west from the mainland.

The vast coast-line of India along with a continental shelf of more than 10,000 square miles and a large number of gulfs and bays indicates the great possibilities of marine resources in the form of sea-weeds, fish and minerals. Sea-weeds about which no proper survey has been made so far can be a good source of food. These can also provide raw materials for many chemical industries. The Indian Ocean also contains several mineral resources like salt, sodium, potassium, magnesium, bromine and chlorine. Except for salt, the other minerals are not exploited to a large extent.

The Natural Divisions of India

A region of such a vast extent is naturally of diversified configuration—plains, plateaus and mountains. Geographically, India presents three natural divisions, each of which is quite unlike the others. These divisions are based on physical conditions:

I. The Mountainous regions of the North.
II. The Indo-Gangetic plain.
III. Peninsular India.

I. *The mountainous regions of the north.* The Himalayas run for 2,000 miles from the eastern extremity of Assam to the western limits of Kashmir with a breadth varying from 180 to 220 miles and contain some of the highest peaks in the world. The Himalayas, a series of parallel ranges intersected by valleys and extensive plateaus, rise abruptly from the plains in the east and gradually in the west. The average height of the Himalayas is over 17,000 ft., and about forty peaks are known to exceed 24,000 ft. The best known of these peaks include Nanga Parbat (26,630 ft.), Nanda Devi (25,660 ft.), Dhavalgiri (26,820 ft.), Mount Everest (29,002 ft.), and Kanchanjunga

(28,150 ft.). *The snow-line* is at a height of about 16,000 feet on the southern slopes of the Himalayas and higher on the northern. These highlands are almost entirely part of the *newfold mountains* of Asia, and consist of long lines of folded ranges of comparatively recent formation. "They form great arcs, curved convexly towards the south or as in the north-east, diverging ridges radiating from a northern mountain complex."

Three distinct parallel ranges are noticeable in the Himalayas: (*a*) *The Great Himalayas** comprising the highest portion with an average height of 20,000 feet. (*b*) the *Lesser Himalayas* comprising the ranges with an elevation of less than 15,000 feet, and (*c*) the *Outer Himalayas* comprising the hills lying between the Lesser Himalayas and the plains. In front of the Outer Himalayas, lies the Terai jungle—the abode of many wild beasts like yak, bear, leopards and sambar on the west, panthers and tigers in the central part and elephants and tigers on the east.

The Himalayan chain acts as a natural protective wall for India and provides rain-water for the plain by arresting the moisture-bearing clouds of the south-west monsoon. And in winter it prevents the piercing cold winds of Central Asia from coming into India. It gives birth to mighty rivers like the Indus, the Ganga and the Brahmaputra along with their tributaries. The Lesser and Outer Himalayas are very rich in animal and forest resources. There are extensive tea plantations in the Outer Himalayas from Assam to Punjab. Physical difficulties do not permit cultivation except in the Lesser Himalayas where rice, chillies, ginger, tea, wheat and fruits are raised.

The intense heat in the plains during the summer induces many people to move up to hill stations of the Himalayas like Darjeeling, Nainital, Ranikhet, Mussoorie, Simla and others. The scenery and mighty peaks of the Great Himalayas also attract tourists and climbers from different parts of the world. All such movements of people have encouraged the development of *hotel industry* in many hill stations. With better means of communication by road and rail, the hill stations are likely to

* The Great Himalayas, again, contain four sections: (*a*) The Kashmir Himalayas, (*b*) The Kumaun Himalayas extending from the Sutlej to the Kali, (*c*) the Nepal Himalayas extending from the Kali to the Teesta river, (*d*) the Assam Himalayas extending from the Teesta to the easternmost frontier of India.

attract more people from the plains. The hotel industry in many hill stations, however, is not comparable in respect of comforts and amenities to what exists in countries such as Switzerland and Italy.

II. *The Indo-Gangetic plain.* This northern plain, situated towards the south of the newfold mountain belt, is part of a great depression which is traceable across northern Africa, southern Europe and southern Asia. It is an alluvium region of 3 million square miles in area. The plain occupies the greater part of northern India and covers more than 1,500 miles from east to west with a width of 200 miles. This plain is formed by the basins of the Ganga, the Indus and the Brahmaputra with their tributaries and has been the cradle of Indo-Aryan civilization from the earliest times. The geographical advantages are (*a*) fertile soil, (*b*) favourable climate, (*c*) flat surface rendering possible the construction of roads and railways, (*d*) rivers for irrigation and navigation and (*e*) mineral products, etc. In the *Gangetic plain,* rainfall is heavy and agriculture is the chief occupation of the people. It contains more than 40 per cent of the total population of India. *The Western plain* beyond the Ganga is more or less dry. Mention may be made of the Thar Desert of India which covers an area of 132,000 square miles in Rajasthan with six million population. This desert is actually the north-western portion of Rajasthan and was the cradle of the Indus Valley civilization. The strong winds that sweep the desert, take away soil or deposit sands over it. Consequently, the desert is marching towards the east. Agriculture is practised with the help of irrigation. Although the region contains only 10 per cent of India's population, it has an extensive and well-developed system of irrigation.*

III. *Peninsular India* is a tableland and lies within the tropics. This tableland is part of an ancient plateau land of unfolded rock of primary origin largely crystalline in character. It is bounded on three sides by mountains—on the north by the Vindhya and the Satpura ranges including the Malwa and the Aravalli plateaux, on the west by the Western Ghats and on the east by the Eastern Ghats. Two coastal strips of flat land exist on the outer side of both the Western and Eastern Ghats

* A few rivers of western Rajasthan have no outlet to the sea and are either lost in the sands or drain towards salt lakes.

—the western coastal strip is known as the Konkan in the north and Malabar in the south; the eastern coastal strip is known as the Coromondal Coast.

The Western Ghats run along the Malabar coast of India continuously for a distance of about 1,000 miles down to Cape Comorin. The plain between the Ghats and the sea is 30 to 40 miles wide. The Ghats look like an immense wall facing the ocean. The mean height is about 3,500 feet, the highest point being 8,700 feet (Dodabetta). The important passes connecting the central tableland with the west include the Palghat, the Thal, Bhorghat and Nama. The Nilgiris form the converging point of the Western and Eastern Ghats by which the Deccan is enclosed.

The Eastern Ghats stretch from the Mahanadi river valley for about 500 miles south-eastwards to the nucleus of the Nilgiris. The mean height of the Eastern Ghats is scarcely more than 1,500 feet. The Eastern Ghats are much less elevated and do not form a continuous chain like the Western Ghats. The Eastern Ghats are at a much greater distance from the coast, the intervening lowlands averaging from 50 to 80 miles.

As the general slope of the tableland is from west to east, most of the rivers flow into the Bay of Bengal. The Mahanadi, Krishna, Pennar, Cauvery and Vaigi flow into the Bay of Bengal. The only rivers which flow into the Arabian Sea are the Tapti and the Narmada. The Peninsular rivers are all rain-fed, and they turn into mere puddles during the dry season. There are a number of coastal streams which are short in length and have limited catchment areas. The principal agricultural crops of the Deccan are cotton, tea, coffee, and spices. Cinchona, cocoanut and forest products are also available.

In the Deccan, there are five natural divisions: (*i*) The narrow west-coast region from Tapti to Cape Comorin receives the full force of the current of the monsoon from the Arabian Sea and, therefore, rainfall is over 100″. The soil is very fertile and the crops are rice, spices and fruits. The density of population is near about 400 per sq. mile. (*ii*) The Black Soil region consists of deep basaltic soil, which is highly retentive of moisture and, therefore, does not stand in need of irrigation. It is extremely fertile and owing to the lime it contains, the region is suitable for cotton growing. Millets, oilseeds and wheat are

also cultivated. (*iii*) North-eastern Deccan has poor soil, but the rainfall is over 50". Tank irrigation has developed most. Rice is the principal crop. (*iv*) Southern Deccan is a *rain-shadow* area, and is frequently visited by famine. The soil is very poor and cultivation is possible only by means of irrigation. The density of population is, therefore, not high. (*v*) The Eastern coastal plain is a low, alluvial land. The northern portion has summer rain and the southern region has winter rain. The coast-line is broken by the deltas of the rivers and many lagoons. The average rainfall is between 40" and 50". Rice is the principal crop. Millets and indigo are also raised.

Distinction Between Northern and Peninsular Rivers

Broadly speaking, the rivers in India fall under two groups —the Himalayan rivers and the Peninsular rivers. The Himalayan rivers have a flow of water throughout the year. Even in summer the rivers receive water from the melting of the Himalayan snow. Flowing through the broad basins they form large tracts of rich alluvial soil on either side. It is no wonder, therefore, that their fertile basins are the natural granaries of the country. The Ganga and the Brahmaputra are navigable and provide excellent waterways for commerce. The irrigation works of Punjab, Bihar and the U.P. depend absolutely on these rivers and their tributaries.

The Peninsular rivers, on the other hand, have water during the monsoons, but shrivel into muddy pools in the dry season. As for example, the maximum discharge of water in the Krishna river in its delta is of the order of 1 million cusecs. In the dry season, however, the supplies of water in the Krishna dwindle to 100 cusecs. The rivers of the south are of little use for navigation on account of their torrential nature in the upper courses, and the rapids that occur where they descend into deep gorges from the tableland to the coastal plain. With the exception of the Mahanadi, the rivers of Peninsular India are never useful as carriers of commerce.

QUESTIONS

1. "The geographical location of the Indian Republic is a factor of great importance affecting her commerce and climate." Examine this statement critically. (Raj. B. Com. 1957).

2. Discuss the position of India with respect to the adjoining land masses and account for its supreme importance among the lands of the Indian Ocean.

3. Give a short geographical account of the coast line of India. Explain how the coasts have influenced the location of ports in India.

4. Divide India into natural regions. Describe the climate, products and industries in each of them.

(W.B.C.S. 1949; Delhi B. Com. 1955; Raj. B. Com. 1962).

5. Describe the geographical advantages of the Indo-Gangetic plain from the point of view of commerce, industry and settlements.

6. "It is said that man's ability in exploiting the resources of his environment will depend upon his knowledge, intelligence and culture as well as on the social structure of the country he lives in." Explain this statement with reference to India.

—(B. Com. Delhi 1958; Rajasthan B. Com. 1960).

CHAPTER II

THE CLIMATIC CHARACTERISTICS

India is so vast in size and so varied in topographical features that a uniform climate does not prevail all over the country. For the purpose of climatological studies, India can be divided into two parts—Peninsular India and Northern India. Peninsular

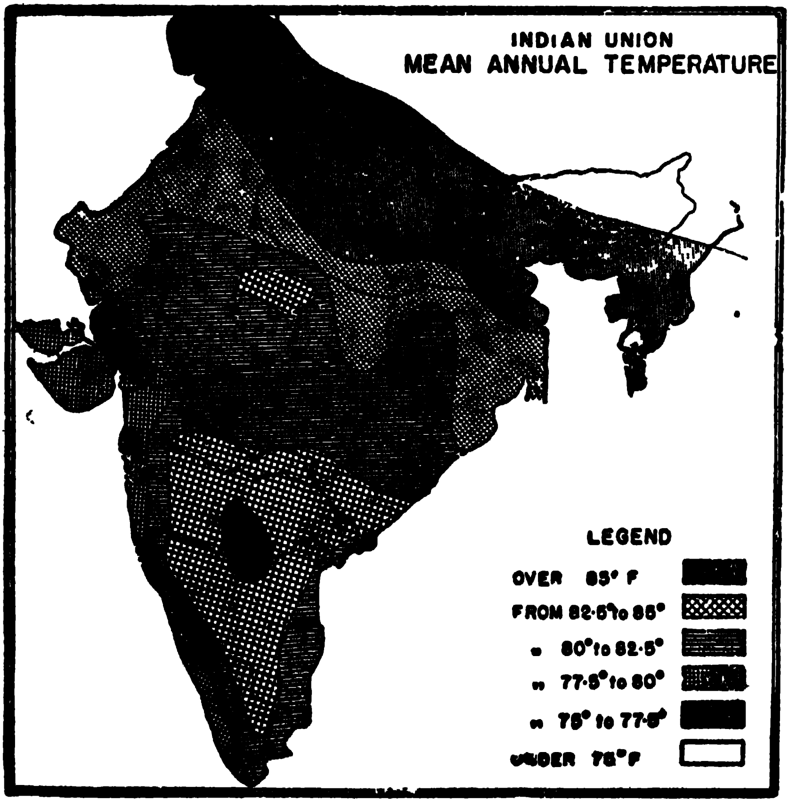


FIG. 2

India has the characteristics of a tropical climate. The temperature is uniformly high and its seasonal variation relatively low.

Northern India lies beyond the Tropic of Cancer. In this region climatic conditions show no general similarity. The western side is very hot in summer and very cold in winter. Air is generally devoid of moisture. But on the eastern side winter is mild and summer is hot with plenty of moisture in the air. The western side includes Punjab and Rajasthan. The eastern side embraces West Bengal, Assam, Bihar and the U.P.

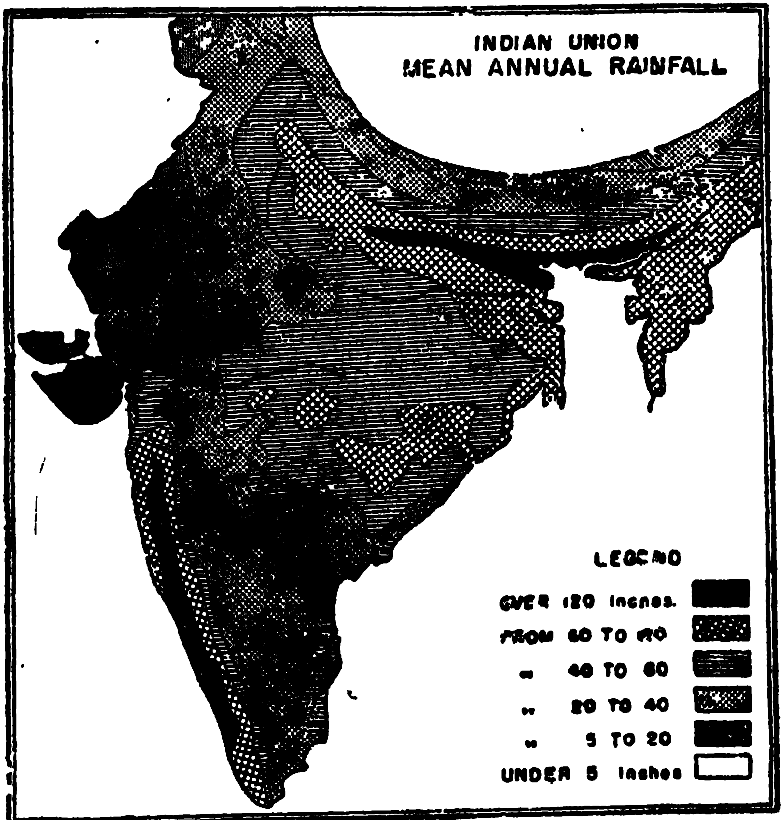


FIG. 3. The normal rainfall varies from an average of 460 inches at Cherrapunji in Assam to 5 inches in Rajasthan, the average for the whole country being 42 inches.

These climatic conditions are disturbed by the monsoon winds. The word "Monsoon" comes from the Arabic word "Mausim" (meaning season) and in India monsoon means the rainy season. There are two Monsoon currents—the South-

West Monsoon and the North-East Monsoon. The South-West Monsoon, blowing in-shore, carries with it particles of water and gives rain from June to September. The South-West Monsoon contributes nearly 75 per cent of the total rainfall in India and reaches the country in two currents—the Arabian Sea current and the Bay of Bengal current. In the pre-monsoon period of March to May, India gets about 10 p.c. of the total rainfall.

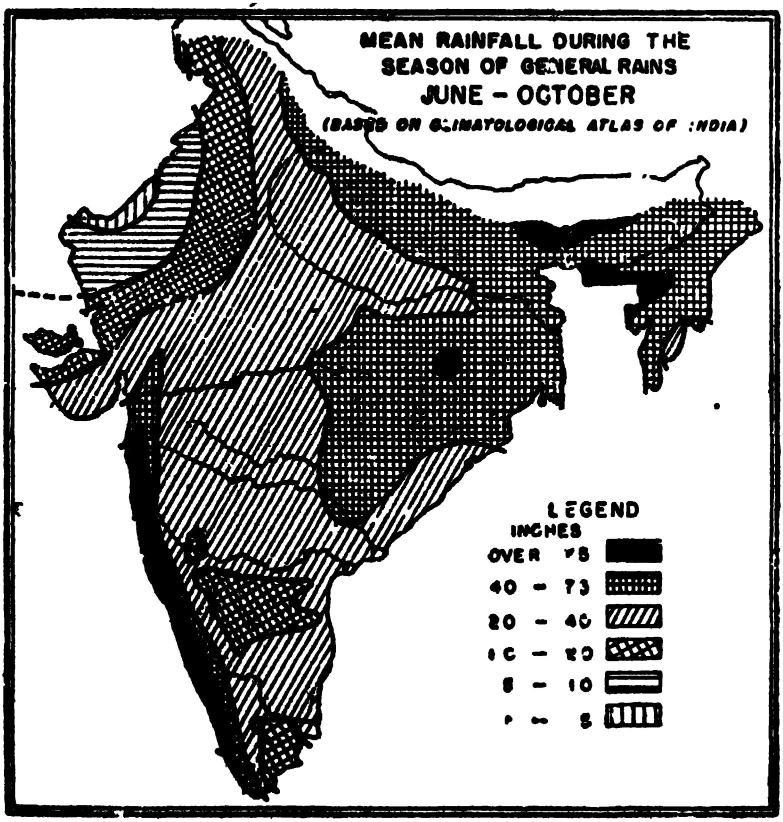


FIG. 4. The major portion of the rainfall comes during the South-West Monsoon period from June to October except in the south-east part of the Peninsula.

The Bay of Bengal Monsoon current, after being obstructed by the Arakan mountains and the Shillong plateau on the east, and the Himalayas on the north, proceeds westward up the Gangetic plain and causes copious rainfall in Assam, West

Bengal, Bihar and U.P. *The Arabian Sea Monsoon,* after surmounting the Ghats and giving rains to the Deccan and Madhya Pradesh, meets the Bay of Bengal current in West Bengal and Assam. This combined monsoon is responsible for heavy rainfall in Bengal and Assam.

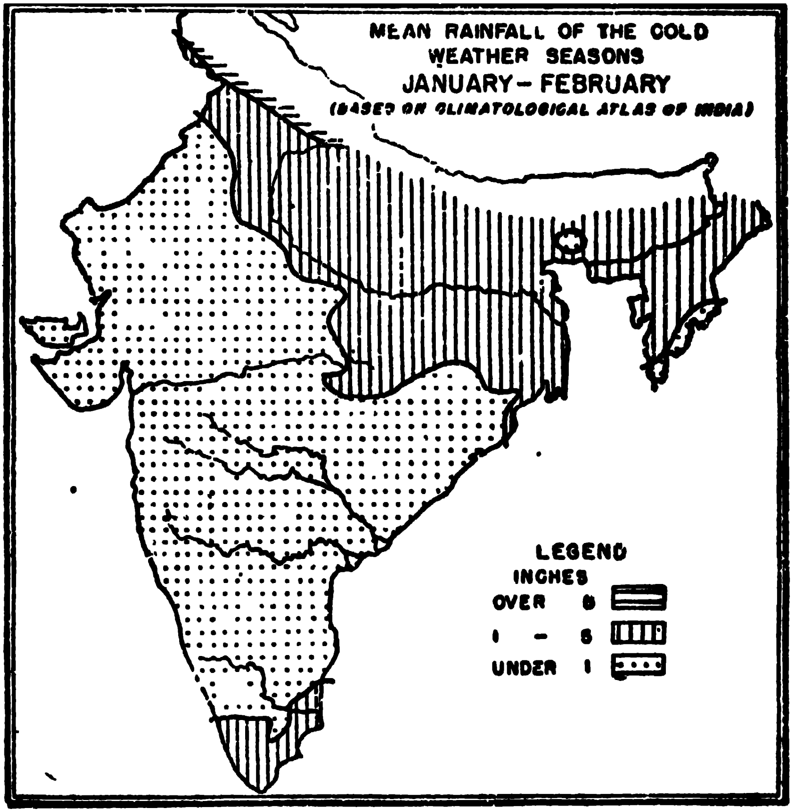


FIG. 5. During January-February, the precipitation in North India is due to the North-East Monsoon. It is scanty but essential for the production of *rabi* crop.

The South-West monsoon begins to retreat from Northern India in the early part of October, and the retreat becomes complete by mid-December. "This retreat is associated with dry weather in Northern India but with more or less general rain on the coastal districts of Madras and over the eastern half of the Peninsula." About 13 per cent of our total rainfall is during the post-monsoon period of October and November.

The *North-East* wind begins in December and lasts till February. During this period dry winds from the belt of high pressure in Central Asia (from the West Mediterranean to Central Asia, and North-East China) pass eastward to Persia and Northern India and cause light rain in Northern India, particularly in the Punjab plains. This rainfall, though scanty, is very important for the *kharif* crops. Another current of cold winds after crossing the Eastern Himalayas moves towards the Madras coast and Ceylon, and gives rain to these areas during November and December.

The average annual rainfall in India is 42 inches and the variations from this normal rainfall are surprisingly great. The overall departures from the normal are as great as +12″ and −11″. These variations affect the growth and yield of crops adversely. Again, the distribution of rainfall in India depends largely on the physical features. "If the hills and mountains of India were effaced, the country would receive much less rainfall and would not be able to support its present population."

The economic importance of rainfall in India is of the highest order, inasmuch as rainfall is an imperative necessity for agriculture. The prosperity of most Indian districts depends on the success or failure of the monsoon, and a very slight variation in the direction of the wet winds may cause a usually well-watered district to become a desert.

DISTRIBUTION OF RAINFALL

Average Rainfall	Percentage to the total area
Above 75″	11
Between:	
50—75″	21
30—50″	37
15—30″	24
Below 15″	7
	100

One of the chief characteristics of rainfall is its unequal distribution over the country. About 33 p.c. of the total area of India always obtain more than 50″ rain a year, and only seven

per cent of the area never get more than 15" rain. *It is not the average rainfall of any region, but the deviation from the normal average, together with its timely distribution, that may cause disaster.* A deficiency in the expected rainfall causes famine, and too much rain spoils the crop, while the early or late arrival of the monsoon may spoil the harvest.

About 209 million acres comprising Andaman and Nicobar Islands, West Bengal coastal region, and Assam get more than 50" rain a year. In these areas, agriculture is dependent entirely

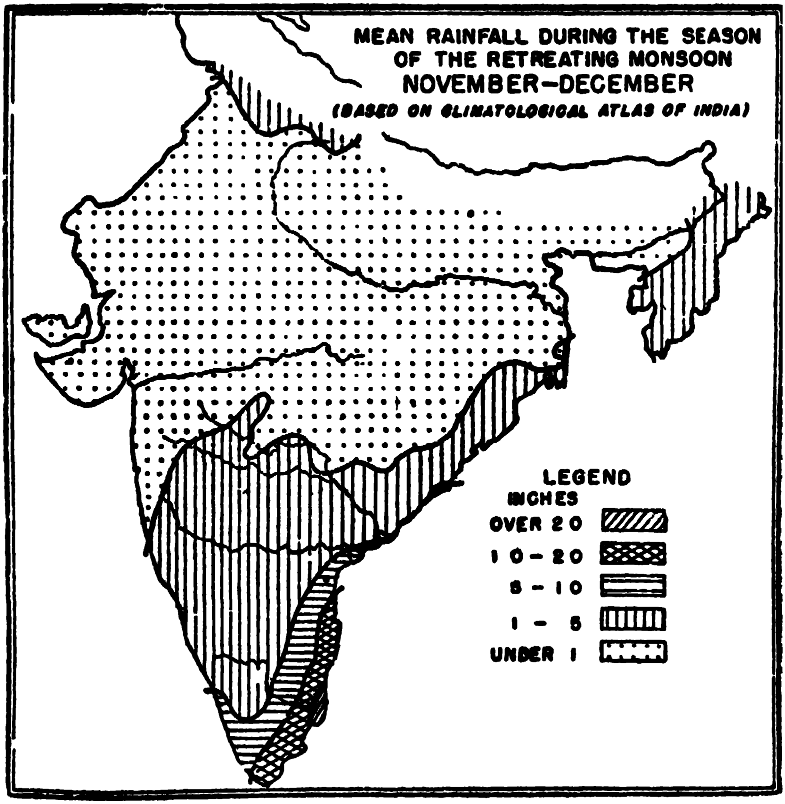


FIG. 6. The south-eastern parts of the Peninsular India receive sufficient precipitation during November and December.

on the rain. U.P., West Madhya Pradesh, Coastal Andhra and Madras receive between 30" and 50" rain a year. Below 30" rains are received by the Punjab, Kashmir, Rajasthan,

North-South Mysore and Gujarat covering an area of 162 million acres.

The most useful classification of areas, according to rainfall, is made into two great zones,—'*certain*' and '*uncertain*'. The zones of *certain rainfall* include West Bengal, Assam, the West Malabar Coast, the Western slopes of the Ghats and the Upper valley of the Narmada.

The zones of *uncertain rainfall* include the U.P., Western and Northern Rajasthan, the Central Rajasthan plateau bordering on the U.P., a large part of the Gujarat State, the whole of Madras (except the actual slopes of the Eastern Ghats), South and West Andhra Pradesh and Mysore and some districts in Bihar and Orissa.

The existence of these extensive zones of uncertain rainfall has been the cause of India's famines. *The so-called famine regions of India are not necessarily the regions of low rainfall —but rather get moderate rainfall with little or no provision for irrigation works.*

The Control of Famines: No country can control rainfall in which either deficiency, irregularity or super-abundance may give rise to disastrous famines. It can, however, provide measures to reduce famines by proper use of surface water and underground water through extension of irrigation works.

The annual rainfall over the entire country represents about 3,000 million acre-feet of water, one-third of which is immediately lost due to evaporation. Roughly 650 million acre-feet seep into the soil, thus leaving 1,350 million acre-feet of surface water to flow into the river system. The use of surface water for irrigation is conditioned by topography, flow characteristics, climate and soil conditions. It has been estimated that though 450 million acre-feet can be harnessed for purpose of irrigation in India, only about 120 millon acre-feet are being used a year.

Of about 650 million acre-feet of rain-water which seep down into the soil, more than half of the volume gets absorbed in the top layers and the other half percolate down into porous strata thus representing the annual enrichment of underground water. Not more than 20 per cent of the annual enrichment of underground water is now used for irrigation. The important problem is to locate areas of underground water.

Although droughts occur frequently in the interior areas of

India, the result need not necessarily be famine if suitable measures are taken in time to utilise surface and underground water.

Though the climate of India is enervating, the mental and physical energy of her people has not been affected adversely. Few nations had such a glorious past in arts and literature and

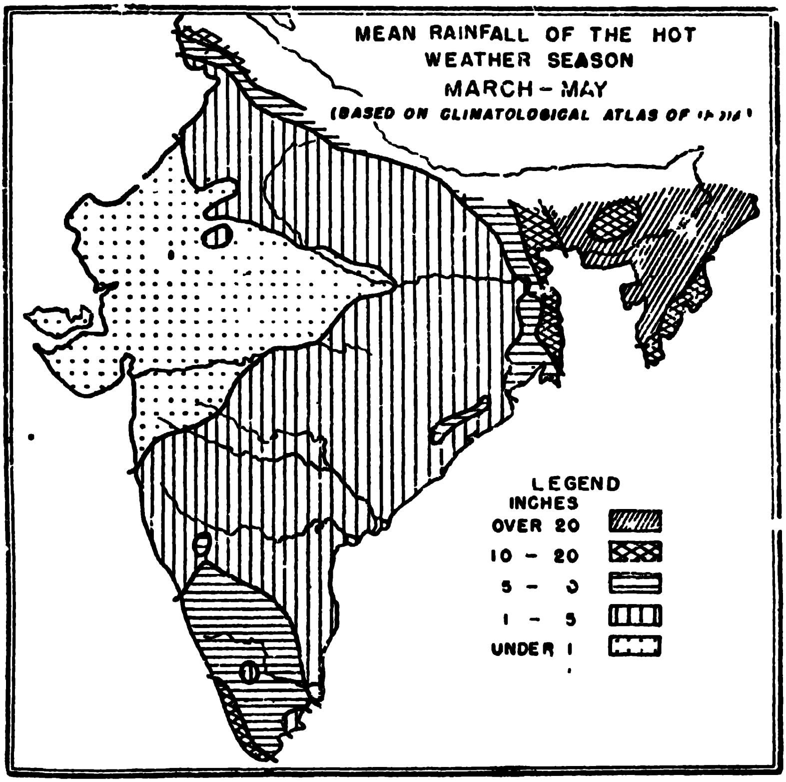


FIG. 7. Assam, eastern border of West Bengal and the narrow coastal strip in Kerala receive abundant rain in March-May.

science and technology. India even today enjoys world-wide reputation in the matter of superiority of designs in handicrafts. With regard to industrial production, her position is seventh in the world. Her people do not consider climate to be a deterrent factor.

QUESTIONS

1. "No factor of his environment exercises a wider influence on man and his economy than climate." How far is this remark true in the case of India? —(Indian Institute of Bankers, 1940; Punjab B.Com. 1957)

2. Discuss the importance of the monsoon to the Indian agriculture. What measures are being provided to reduce the extent of dependence of agriculture on the monsoon?

3. "The so-called famine regions of India are not necessarily the regions of low rainfall, but rather get moderate rainfall with little or no provision for irrigation works". Explain.

4. Explain how the distribution of rainfall in India depends on the physical features.

5. Discuss the economic consequences of variations of rainfall in India.

CHAPTER III

SOILS AND SOIL REGIONS

"Soil is the collection of natural bodies occupying any portion of the earth's surface that supports plants and that has properties arising from the integrated effect of climate and living matter, acting upon parent material, as conditioned by relief,

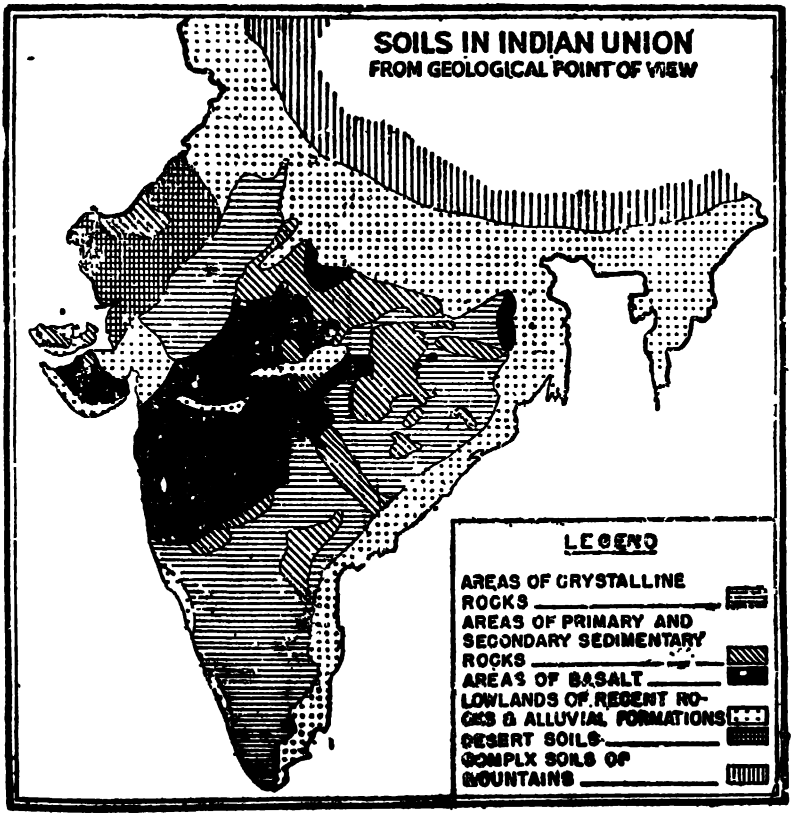


FIG. 8. Soils in India play a great part in the development of agriculture and in the distribution of population.

over periods of time." A productive soil is the most important factor for successful agriculture. Soils differ in their capacity to

produce crops. Some are fit for profitable agriculture, others are impoverished by soil-depleting practices; and still others are poor to start with but made fertile by efficient management. The various types of soil that are found in India have been influenced in their formation by the wide diversity in geology, topography and rainfall.

Soils are seldom uniform over any large area and many kinds of soils may occur even in a small area. Often a number of different kinds of soil occur in association with a more or less definite pattern.

The nature of soil is a factor of the utmost importance to crop production. On the whole soils in India are good in quality. Only in limited areas can they be rated as bad from the point of view of fertility. Eight soil regions are generally recognised in India some of which are quite inclusive of a rather wide variety of soil conditions while others have quite uniform and consistent soil characteristics throughout.*

(*i*) Alluvial soils including deltaic, coastal and inland alluvium.
(*ii*) Black soils including the regur and shallow grey black soils.
(*iii*) Red soils including red loams and yellow earths.
(*iv*) Laterite soils.
(*v*) Mountain and Hill soils.
(*vi*) Terai soils.
(*vii*) Arid and Desert soils (84,000 square miles).
(*viii*) Peaty and other organic matter (3,000 square miles).

Agriculturally the most important soils are the alluvial ones which occupy extensive tracts of land and include the greater parts of Gujarat, Rajasthan, Punjab, the Uttar Pradesh, about half of West Bengal, the Godavari, Kistna and Tanjore districts

* We get the earliest information about Indian soils from the *Land Settlement Records*. The information is useful, but is insufficient and lacks a scientific background for efficient utilization of land. Soils in India were also studied *from a geological point of view* by the Geological Survey of India. In the Punjab, soil surveys were made for *irrigation purposes*. Soils also have been classified as follows: (*i*) alluvial soils, (*ii*) alluvial soil impregnated with varying amounts of salts, (*iii*) coastal sandy alluvium, (*iv*) old alluvium, (*v*) saline and deltaic soil, (*vi*) calcareous soil, (*vii*) deep black soil, (*viii*) medium black soil, (*ix*) shallow clay loam, (*x*) mixed red and black soil, (*xi*) red loam, (*xii*) red sandy soil, (*xiii*) mixed red loam and red sandy soil, (*xiv*) gravelly soil, (*xv*) sub-montane soil, (*xvi*) Terai soil, (*xvii*) marshy land, (*xviii*) Peat soil, (*xix*) desert soil.

Several soil laboratories have been set up throughout the country so that ultimately farmers can be advised in regard to manures and fertilisers suitable for local conditions.

in the south and Assam. The eastern and western coastal lands of the Deccan are lowlands of alluvial formations.

The alluvial soils are rich in chemical properties and are capable of yielding a large variety of *rabi* and *kharif* crops. The alluvial soils are deficient in phosphoric acid, nitrogen and humus; lime and potash are sufficient. In characteristics, these soils belong to the *brown steppe* soil group which is found in Russia, North America, Australia, Africa and South America—usually at the fringe of desert soils.

The alluvial soils of the Upper Ganga valleys are dry, porous and in some places sandy, yielding crops that do not need the retention of much moisture about their roots. At present in these areas cultivation has much developed with the help of irrigation. The absence of hills makes it easy and comparatively cheap to make canals and distribute the water over the length and breadth of the Ganga valley. The alluvial tracts of Bengal are more compact, less coarse and more moist than elsewhere and yield rice, jute, sugar-cane, tobacco, etc., rather plentifully. The alluvial soils of the Deccan coastal stripes are non-porous, clayey and of a dark colour.

The black soils comprise the greater part of Maharashtra, Gujarat, the western part of the Madhya Pradesh, south of U.P., south-east of Bihar, north-west of Orissa, and the western part of Andhra Pradesh. The soils of this region vary in different parts in character and productiveness. The soils are poor, thin and porous on the slopes and the uplands of the Deccan hills where millets and pulses are the main crops. In the lowlands, the soils are deeper and darker-coloured, suitable for wheat, millets and cotton. The most important soil in the Deccan trap area is the *regur* or *black cotton soil,* found mainly in the valleys of the Tapti, the Godavari, the Narmada and the Krishna and parts of Madhya Pradesh and Gujarat. "This soil is the product of the decomposition of lavas. It is of a dark colour and is exceedingly compact and tenacious. It is highly retentive of moisture and rich in chemical properties." Cotton, jowar, wheat, linseed and gram are cultivated in these areas.

Red soils comprise the whole of Madras, Mysore, and South-east Maharashtra and extend through the east of Andhra Pradesh and Madhya Pradesh to Orissa and Chotanagpur. It is also found in the Santhal Parganas and the Birbhum district of

West Bengal, the Mirzapur, Jhansi and Hamirpur districts of Uttar Pradesh, Madhya Pradesh and eastern Rajasthan. The consistency, depth and fertility of the soil vary widely in different areas. The poor, sandy and light-coloured soils of the arid uplands yield only bajra, while the rich, deep, bright-red fertile loam of the plains produces a wide range of excellent crops. Nitrogen, phosphoric acid and humus are generally deficient in red soils but potash and lime are normally sufficient. Although the red soil tracts are drained by the Mahanadi, Godavari, Krishna and Cauvery, the use of water by means of canals for irrigation is absent because of the uneven surface except at the deltas. The construction of wells is also difficult because of the rocky nature of the surface. The red soil areas are, however, admirably suited for storage of rain-water in tanks, In Madras, Mysore and Western Andhra Pradesh, cultivation is carried on with the help of tank irrigation.

The laterite soil is found in Andhra Pradesh, Assam, West Bengal, Orissa and along the Western and Eastern Ghats. The soils are formed by the weathering of laterite rocks. "The distinguishing peculiarity of these soils is their acidity, and the main agricultural problem is the correction or amelioration of this acidity." Since the tea-plant requires acidity, tea-plantation is common in these areas. The laterite soil differs widely from one region to another. Generally speaking, they are poor on the higher levels and cannot retain moisture. In the plains, however, they consist of heavy loams and clays and can easily retain moisture.

Mountain and hill soils are suitable for the growth of forests in the hilly parts of the north and specially Darjeeling, Almora and Garhwal districts. *Terai soils* are covered by tall grasses and shrubs of no agricultural value. These are found in a narrow strip in the Uttar Pradesh and Bihar between plains and hills including Nainital, Pilibhit, Kheri, Gonda, Basti and Gorakhpur. The eastern strip of Kerala has also this soil. *Arid* and *desert soils* are found in Rajasthan and mostly contain sands, often with high soluble salt contents. These soils have very low organic matter. Certain parts of Kerala and Bihar contain *peaty and other organic matters. Sub-montane soil* is confined to the whole of Simla, most of Kangra and part of Gurdaspur in Punjab.

Problem of Soil Erosion

For the success of agriculture in India, it is necessary to maintain a high fertility level of the soil. As the soils are usually six to twelve inches in depth, care must be taken in the proper use of land. Waterlogging and the consequent salinity and alkalinity which have become quite common in many irrigated areas, have brought great soil deterioration. There can be no increase in agricultural production unless efforts are taken to retain and use soil judiciously. In other words, soil conservation is essential to continued agricultural prosperity.

Unfortunately, however, in India to-day many soils have become so depleted in fertility or so eroded that they are no longer suited to agriculture. Soil erosion occurs in Bundelkhand, Madhya Pradesh, Bihar, parts of Maharashtra, Madras and Punjab. In the areas of Maharashtra-Deccan alone, about one-third of the land has become unfit for agriculture on account of soil erosion. In Orissa 1,200 sq. miles of area have been affected by erosion. In Punjab, too, large areas of fertile land have been rendered useless by soil erosion. In fact, soil erosion is an age-old problem.

The progressive deterioration of soil in India is one of the main causes of India's low productivity in agriculture. "It has been estimated that about 200 million acres of land, that is, almost a fourth of the country's land surface is suffering from soil erosion ".*

The agencies of erosion are winds, water and waves, of which, in India, the water erosion is most pronounced. There are three kinds of water erosion—*sheet, rill and gully.* Sheet or surface erosion takes place in the form of uniform removal of soil from the surface of sloping lands by rain-water. In the hill-tracts of Assam, North Bihar and the Kumaun region of Uttar Pradesh, such loss of soil is steadily going on. Sheet erosion develops so slowly that its injurious effect is not noticed before serious damage is done. The falling drops of rain lift the soil in the air and splash it back and forth. A grassland cover can save the soil. Rain drop erosion may also be reduced by leaving the soil surface rough with some clods as compared with a smooth and finely pulverised surface.

* III Five Year Plan.

Rill erosion is common in Bihar, Uttar Pradesh and parts of Madhya Pradesh where rains cause formation of tiny channels on bare soil. *Where such rills are enlarged, they are known as gullies.* Such gullies not only take away the surface soil but also sub-surface and sub-soil. Thus gullied lands are partially or completely abandoned by farmers although intergully areas are used for pasture.

In Rajasthan and the districts of Gurgaon, Hissar and Karnal in Punjab, top soil is removed by the action of winds. From April to July, wind carries sands from western Rajasthan and covers not only the surface soil but also injures the plants with its abrasive action. Wind erosion is a quick process and can take lands out of cultivation in a short period of time. The progress of the winds can be arrested by planting trees. Techniques are being developed for stabilising moving sand dunes and shifting sands around Jodhpur area. In the Third Plan period, about 100,000 acres of desert areas will be brought under suitable soil conservation measures including afforestation and pasture development.

Soils vary in their resistance to erosion. A coarse soil can resist erosion because it can absorb the rains rapidly. Erosion is also influenced by the slope of land. The slope determines the rate of flow of water over a surface. The speed of water in its turn determines its power of eroding. "The important task of soil conservation is therefore to retard the flow of water on slopes and dispose of surplus water through canals." On sloping crop land, contour farming can help conservation of soil and water. This means that when ploughing; planting, cultivating and harvesting are done at right angles to the natural direction of the slope of the land, the flow of water is interrupted, and the penetration of water into the soil is facilitated.

The Government of India is taking a great interest in land use as a national problem and has prepared programme for the control of soil erosion. It has set up the Central Soil Conservation Board to organise, coordinate and initiate research on soil conservation as well as to assist States in technical and financial matters of soil problems. Already in many parts of Northern India, soils which were poor to start with, have been made fertile and brought into production. During the second Plan period,

soil conservation work has covered about 31 lakh acres, comprising 20 lakh acres agricultural land, 4 lakh acres desert and coastal sand dunes, 2 lakh acres in hill regions, 1 lakh acre ravine land and 1 lakh acre waste land and lands eroded by Sea. The programme for the Third Five Year Plan envisages soil conservation for 13 million acres of agricultural land, afforestation for 2 million acres and dry farming for 40 million acres.

It may be mentioned that the manner of irrigation practices has often been responsible for soil deterioration in India.

QUESTIONS

1. Give an account of the soils in India. Classify them and give their characteristics. Indicate in this connection the problems of soil erosion in India. (Raj. M. Com. 1956).

2. What factors have brought soil deterioration in India? What are the effects of soil deterioration?

3. Discuss the measures that are being taken to control soil erosion?

4. Draw a map of India and indicate the major soil regions. Also, mention the principal crops that are grown in each region.

CHAPTER IV

THE DISTRIBUTION OF POPULATION

The most decisive productive force of a country is its distribution of population. The extent of utilization of natural resources is much determined by the character and density of population.

The people of India are highly intelligent, enterprising and peace-loving. Their civilization dates back to some 5,000 years before the Christian era. In art, literature, science, architecture and industry, the people achieved fame at a time when the rest of the world was almost dark. The vitality of the people of India has made itself felt in Burma, Ceylon, Malaya and Indonesia where we find a large number of Indians as immigrants. The Indians have shown to the world that peoples of different races, languages and religions can live side by side in peace and unity when the rights of all are treated with tolerance and respect.

Thus, India with 434 million population is the world's second most populous country, containing as she does nearly one-fifth of the world's total population.

The zone-wise distribution of population is as follows: (*a*) North India 98·2 million, (*b*) East India 90 million, (*c*) South India 75·6 million, (*d*) West India 40·6 million, (*e*) Central India 52 million.

In proportion to the area of the country and specially the area available for cultivation, the density of population per square mile in India is amongst the highest in the world. The arithmetic density of population in the country is about 380 per square mile. The *man-land* ratio does not give an accurate measure of real density. Equal areas vary greatly in their capacities and resources for supporting population. The index of population density can be accurate if it can be shown *per square mile of productive land of an area.* The productivity of land depends on climate, soil, configuration, vegetation and mineral resources. The density of population can also be measured in terms of arable land which is known as *physiological density.*

DISTRIBUTION OF POPULATION IN 1961

S. No.	State/Union Territories	Area in square miles	Population	Density per square mile
	INDIA	11,27,345	43,44,24,429	384
1.	Andhra Pradesh ...	1,06,052	3,59,77,999	339
2.	Assam	47,098	1,18,60,059	252
3.	Bihar	67,198	4,64,57,042	691
4.	Gujarat	72,154	2,06,21,281	286
5.	Jammu & Kashmir ...	N.A.	35,83,858	N.A.
6.	Kerala	15,003	1,68,75,199	1,125
7.	Madhya Pradesh ...	1,71,210	3,23,94,375	189
8.	Madras	50,132	3,36,50,917	671
9.	Maharashtra ...	1,18,884	3,95,04,294	332
10.	Mysore	74,122	2,35,47,081	318
11.	Orissa	60,162	1,75,65,645	292
12.	Punjab	47,084	2,02,91,151	431
13.	Rajasthan	1,32,150	2,01,46,173	152
14.	Uttar Pradesh ...	1,13,454	7,31,52,914	650
15.	West Bengal .	33,928	3,49,67,634	1,031
16.	Nagaland	6,236	N.A.	N.A.
	UNION TERRITORIES			
1.	Andaman & Nicobar Islands	3,215	63,438	20
2.	Delhi	573	26,44,058	4,614
3.	Himachal Pradesh ..	10,879	18,48,982	124
4.	Lacadive, Minicoy and Amindivi Islands ..	11	24,108	2,192
5.	Tripura	4,036	11,41,492	283
6.	Manipur	8,628	7,78,318	90
7.	Dadra-Nagar Haveli ...	189	N.A.	N.A.
8.	Goa, Daman, Diu ..	1,426	N.A.	N.A.

In India the density of population per square mile of arable land is about 600. For an agricultural country, such density is too high, specially when the yield of crops is also low compared with the Western countries.

A noticeable feature in connection with the population in India is the rapid growth of its numbers. The average rate of increase in the country's population during the Second Plan has been 1·9 p.c. which is likely to go up to 2·14 p.c. during the Third Plan period. In other words, India's population will be 492 million in 1966; 555 million in 1971 and 625 in 1976.

The distribution of population depends largely on the external environment of a region. Climate, soil, natural resources, topography, etc., largely determine the number of

people a given territory can support. In India the density of population generally varies with the amount of rainfall. Population is thick in those places where the rainfall is not only heavy but certain as well. Thus Lower Gangetic plain, Upper Gangetic plain, Malabar-Konkan, South Madras and the coastal regions of Madras and Orissa are areas of high density of population. These six regions cover 179 million acres of land but support more than 200 million population with an average density of 700 per square mile. These areas possess fertile soil, level land and rainfall sufficient for the development of agriculture. But unhealthy regions like the *Sundarbans* in the Lower Gangetic delta cannot attract people although these regions receive heavy rain. There are areas in India where rainfall, though scanty, supports a large population with the help of irrigation. The western parts of the U.P. have been developed by irrigation.

GROWTH OF POPULATION IN INDIA

Year	Millions	Year	Millions
1952	367	1956	387
1953	372	1957	392
		1958	397
1954	377	1959	402
1955	382	1961	434

Mountains, hills and deserts do not attract people for settlement. In hills and mountains land is limited for cultivation, and roads and railways are very difficult to construct; rivers are swift-flowing and are, therefore, useless for navigation. Cultivation is not possible in desert areas except with the help of irrigation. The areas of low density of population in India are the Thar desert, the Western Himalayas, the Eastern Himalayas, North-Western hills, North-Central hills and plateaus and North-Eastern plateaus which cover 392 million acres of land but support only about 90 million population with an average density of 150 per square mile.

The density of population is also determined by the economic progress of a country. In Europe and North America, the density of population is great in urban and suburban districts and is usually a sign of progress made in mining or industrial

or commercial occupations. In India nearly 86 per cent of the total population is, in the main, village-dwelling. This is because agriculture is the mainstay of the great majority of the people. Eastern Punjab, the Upper Ganges basin, the Lower Ganges basin, the eastern marginal plain, the western marginal plain and the south-eastern plain are the most densely populated parts of India. In all these areas agriculture occupies a preponderant position.

During the last 40 years the population in India has increased from 275 million in 1921 to 434 million in 1961. About 70 p.c. of India's population still depend on agriculture for their livelihood, which shows that all the industrialisation and urbanisation during the last 40 years have not really been able to reduce the pressure on land. It must, however, be admitted that the situation might have been worse but for the secondary and tertiary employment. The fast-bulging population will have tremendous effects on the future economic development of India. "It is least likely that the population growth will be automatically adjusted to match the economic growth." The future will depend on the rate of arrest of child birth as well as on the rate of resources development.

About 20 million rural families who depend directly on agriculture, have little or no land and rely on wage earnings. A proper utilisation of this over-abundant supply of agricultural labour, will not only increase output per acre, but also the total food production. More than this the level of income of cultivators, which is today barely one-third of the national average, will also rise.

The problem of increased and increasing population in industrial countries is solved by a readjustment of population in the different areas of the same country, reclamation of waste-lands, better utilization of economic resources, growth of manufactures, and expansion of foreign trade as well as by emigration.

In India there are always some shifts of population from agriculturally congested areas to industrial areas. Every year Bihar, Orissa, Uttar Pradesh and Madras send out a large number of persons to other States where they are employed in factories, plantations and mines. Assam, Maharashtra, West Bengal, and Madhya Pradesh receive the majority of these emigrants.

A large number of emigrants from Bihar, Orissa, Uttar-Pradesh, Madhya Pradesh and Nepal have settled in West Bengal. Of the total immigrants who have settled in West Bengal from other states, about 60 per cent is from Bihar and Orissa and 18 per cent from Uttar Pradesh. These people are mostly employed in the mills and factories of the Hooghly basin and in the tea-plantations of the Darjeeling district.

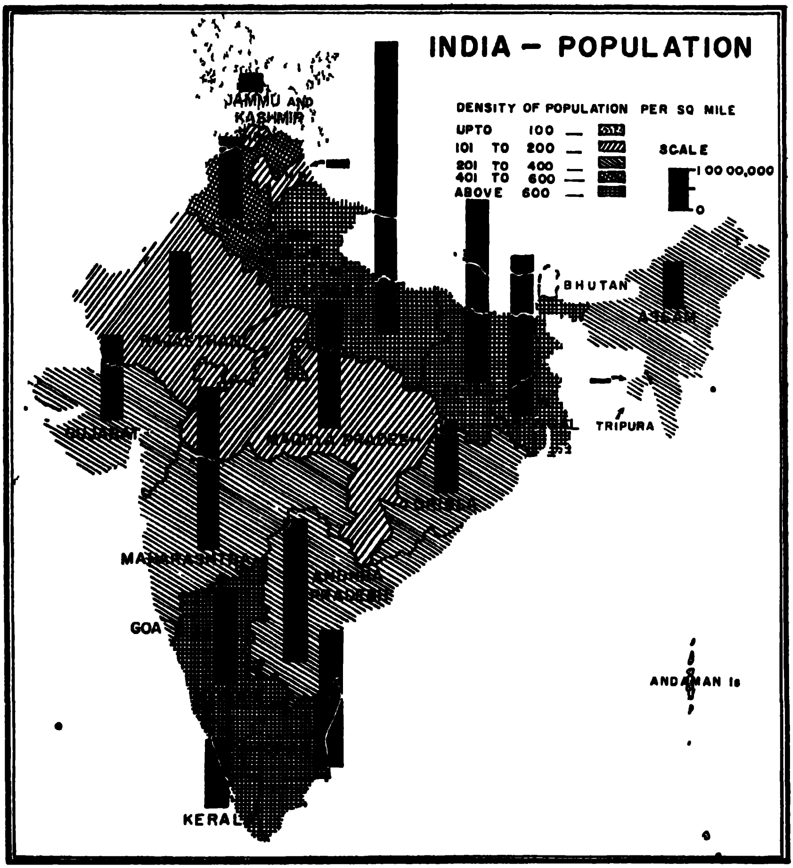


FIG. 9. The density of population of India as per census 1961

Tea-plantations and large tracts of cultivable lands of Assam have attracted many immigrants there and to-day these people form about one-fourth of the total population of the State. For

tea-plantations the recruiting grounds are Bihar, Orissa, Madhya Pradesh and Madras. In the pre-partition days, many peasants from Mymensingh and Comilla (now in Pakistan) migrated to Assam and settled in the Nowgong district. Although Assam is a big State and contains comparatively a sparse population in relation to many other States in India much of the area is covered by forests and hills. About 39 per cent of the area is forested. Besides, some of the areas are highly malarial. Until all such areas are properly reclaimed, Assam in its present stage of economic development may not encourage immigration of persons from other States. Inter-state migration of population is perhaps a possible solution for many of India's population problems, but then, there are certain obstacles in the way. People have many ties to the land they now occupy, though after the partition of India and with the influx of refugees, this factor has become less operative. Then there is the cost of travelling, *domicile* restrictions and the cost and labour incurred in building their new homes. It must also be admitted that difference in population pressure between neighbouring States can be a major cause of an interprovincial conflict.

The problem of over-population in India cannot be solved by encouraging emigration of Indians to other countries. At present emigration from India for unskilled work is not allowed. Emigration for skilled work is permissible under certain conditions. Canada and the U.S.A. admit Indians on a quota basis. Fresh Indian immigration is either banned or is not permitted as a matter of policy into South Africa, Southern Rhodesia, Australia, New Zealand, Ceylon, Burma and South American countries. Thus, emigration outside India as a measure of population relief is after all a matter dependent entirely on the attitude of the countries that could absorb such surplus. In 1958, a little above four million Indians were outside India, of whom 2·7 million were in the Commonwealth countries. Nearly 75 per cent of the Indian emigrants live in Burma, Ceylon and Malaya. The majority of them are employed as labourers in sugar and rubber plantations and in mining. The present population of Indians in Burma is almost 7 lakhs. Indian immigration into Burma is subject to regulation and restriction in regard to purchase and transfer of property by non-Burmans. The Indians as such have no franchise. Those

Indians who have become Burmese citizens are, however, entitled to all privileges.

INDIANS OVERSEAS 1960

(in '000 persons)

Ceylon ...	... 830	Jamaica ...	... 26
Malaya ...	... 740	Trinidad ...	... 267
Mauritius	... 376	British Guiana	... 210
Kenya ...	... 127	Fiji ...	... 169
Uganda ...	... 50	Canada ...	... 4
Zanzibar ...	... 16	Australia & New Zealand	... 4
Tanganyika	... 68	Total ...	... 3,744 (approximately)
Burma ...	... 600		
Aden ...	... 16		

Ceylon has nearly 20 per cent of the total Indian emigrants, forming, as they do, about one-seventh of the total population of Ceylon. They are mostly engaged on the tea and rubber plantations. The emigration of Indian labour to Ceylon has declined in recent years because of low wages offered to the Indians. There are also restrictions against the settlement of Indians in Ceylon. Malaya contains 15 per cent of the Indian emigrants whom it engages in mines and plantations. It appears that both Ceylon and Malaya have reached the saturation point and cannot absorb any more Indian labour.

Nor is the position of Indian labour better in Australia and South Africa. In the early stages of its economic development, South Africa had to invite Indian labour for work on railway construction and in mines. In South Africa, there are 220,000 Indians (the great majority of whom were born in that country) consisting of labourers, traders and professional people. The South African Government now does not want Indian immigrants because of the problem of competition with white men for land and employment. The white settlers of South Africa find that the Indians are ready and eager to do their work at far lower rates of pay. The present policy of the South African Government is, therefore, to curtail civic rights of the Indian immigrants, "restrict their opportunities of acquiring land out-

side well-defined areas, and limit their choice of employment for the sake of saving 'white South Africa'."

Australia has an area of 3,000,000 square miles with a population of hardly 10 millions, the bulk of which live in a narrow belt running from a little north of Sydney round the coast of Adelaide and in the south-west corner. The density of population is nowhere high. There is opportunity, therefore, for the population to increase many times its present figure. Indeed, the lack of labour is a handicap to the development of Australian industries. The Australian Government has, however, put restrictions on the immigration of Asians on economic grounds.

India has become alive to the fact that the present increase in population demands immediate actions to raise agricultural production and industrial capacity.* India's capacity to keep pace with the growth of population need not depend solely upon the production of food grains and commercial crops but also upon the developments in the secondary and tertiary sectors of the economy. "Unlike Japan, India will not be able to find adequate markets abroad for the very large industrial output which will be necessary to provide employment for, and to improve the standard of living of, her massively increasing population." India should plan a co-ordinated and parallel development of large-scale basic industries, small-scale agro-industries and agriculture. "In India, the problem is not merely one of finding employment for her population and of producing more, it is also important that she should herself be able to absorb most of her own production, agricultural as well as industrial."

Illiteracy, high death rate, low life expectancy, low standard of living and disease are other social evils which are also connected with our problem of population. About 70 p.c. of the population are illiterate; 110 per thousand infants die at birth; life expectancy is 37 years compared to 65 in Japan, 66 in U.K., 65 in Canada and 69 in Holland; average per capita income in a year is about $70 against 1,500 in U.S.A., 700 in U.K., 900 in New Zealand, 700 in Australia, 900 in Canada, 800 in Switzerland. Communicable diseases are still very common in India as

* "Misery exists in India neither because the nation is overrun with people nor because her soil is saturated. The true causes have to do with inadequate exploitation of resources both material and human." J. D. Castro, *Geography of Hunger*, Victor Gollancz Ltd., London, p. 154.

their source is the man himself which he transmits to others either by respiratory or digestive tracts.

Racial Background

India is the only country in the world which contains a great diversity of races at every stage of civilization. It is because various races came from outside from time to time and settled in India.

(*i*) The *Negroid* or *Negrito* race was the oldest to settle in India from Africa. This has now almost disappeared on the Indian mainland, but traces have been found in the Rajmahal Hills. The Andamanese belong to the Negrito race.

(*ii*) Next came the *Proto-Australoids* from Palestine. They were long-headed, dark-skinned and snub-nosed. The aboriginals of Madhya Pradesh belong to this race. These people are the genuine and real ancient Indians. They are named Proto-Australoids because if we compare them with 'the aborigines' of Australia we find that in the shape of the head and face, the form of hair and skin colour, they are essentially alike.

(*iii*) The *Austrics,* a branch of the Mediterranean race, came through Mesopotamia in pre-historic times. They were long-headed, comparatively fair, and straight-nosed. They settled in North India. Later they migrated to Burma, Indo-China, Malaya and Indonesia. They are found today in the hills and jungles of Madhya Pradesh and North-Eastern India, and they form about 1·3 per cent of the total population of India. The Kols, Santhals, Khasis, Nicobarese belong to this race.

(*iv*) The *Dravidians* came to India before 3,500 B.C. from the Aegean Islands and Asia Minor. These people were highly civilised and built many cities in Sind and the Punjab. As they migrated towards the south and the Gangetic plain, they came in touch with the Austrics and absorbed a large amount of their blood. "They with the Austrics supplied some of the fundamental bases of Hindu religion and civilization." At the present day, the Dravidians live mostly in Peninsular India and form 25 per cent of the Indian people.

(*v*) Next came the *Aryans* from the Northern Mesopotamian regions about 2,500 B.C. *via* Iran. They had white skin, finely-cut noses and were tall. To-day they account for 73 per cent

of the population of India and occupy chiefly Punjab, Kashmir, Rajasthan, U.P. and Bihar.

(*vi*) The *Mongoloid* race came after the Aryans. "They appear to have spread from their primitive home in North-Western China about the middle of the first millennium B.C. into Tibet, and in the subsequent centuries they penetrated through the Himalayas and through Assam into the Himalayan regions and the plains of North and East Bengal and the hills and the plains of Assam." These people occupy parts of Eastern Kashmir and Assam. They have yellow skin.

Because of the topographical conditions, the races which came earlier, were not annihilated by new settlers, but every incoming wave of conquerors pushed them down south and eastward. The hills and forests provided shelter to a large number of primitive tribes who were left there undisturbed. This probably explains why some of the existing racial types in India retain certain primitive strains.

There has been great intermixture, and pure racial characteristics are hardly to be found. The *Aryo-Dravidians* are a mixed race of Aryans and Dravidians. They occupy Uttar Pradesh, Bihar, Maharashtra, Gujarat, Madhya Pradesh and parts of Bengal. The *Mongolo-Dravidians* are a mixed race of Mongols and Dravidians. They occupy the eastern parts of Bengal and Assam. They have dark complexion, medium height and broad noses. The *Scytho-Dravidians* are a mixed race of Scythians and Dravidians. They are found in Gujarat and Western Deccan. The Marhattas are of this type.

In spite of the different racial origins, the people of India are not conscious of such differences. With a few exceptions, the people of India show little interest in tracing their racial origin elsewhere. In fact, the people have always considered themselves as belonging to the same race. The differences which exist are related to social customs of a region which in a country of the size of India are inevitable. To a larger extent, such differences are also noticeable in many smaller countries of the world.

Languages

India is a land of many languages. According to the Linguistic Survey of India, there are 179 languages of which

116 are current among less than one per cent of the entire population of the country. When we take into consideration the language of the large, advanced and organised communities, we find only 12 major languages in India.

LANGUAGE DISTRIBUTION*

State		Language	State		Language
Jammu and Kashmir		Dogri Kashmiri	Mysore	...	Kannada
			Kerala	...	Malayalam
Punjab ...	...	Punjabi Hindi	Madras	...	Tamil
			Andhra Pradesh	..	Telugu
Rajasthan	...	Hindi	Orissa	...	Oriya
Uttar Pradesh	...	Hindi	Bihar	...	Hindi
Madhya Pradesh	...	Hindi	West Bengal	...	Bengali
Maharashtra	...	Marathi	Assam	...	Bengali Assamese
Gujarat	...	Gujarati			

Tamil, Telugu, Malayalam and Kannada are spoken by about 66 million people while 230 million people speak Punjabi, Hindi, Gujarati, Marathi, Bengali, Assamese, Oriya and Kashmiri.

The multiplicity of languages is no bar to nationhood. Some important States like Canada, South Africa, Spain, Czechoslovakia, Switzerland, China, Soviet Russia, the States of South America and Belgium have many languages, some of them having two or three court languages.

Too much emphasis, therefore, need not be given to the problem of languages in India. One can travel throughout Northern India and a good part of the Deccan also with a little knowledge of Hindi.

In a sense, English is now as much an Indian language as any other language—the distinct fact being the scattered areas over which such people are distributed. For many years, English has been a neutral language in India, and did not give any special privilege to any particular group. Its role for intellectual progress and national unity in the past and even today, is quite significant.

Both Hindi and Urdu are identical in points of grammar and syntax and can be regarded as really one speech, split into two, by two totally different scripts. Hindi is written in Dev-

nagri script while Urdu is in Persian-Arabic script. During the Mughal period when the Persian and Turkish-speaking Mohammedans met the Hindus in mart, in camp or in the battlefield, the former in order to make themselves understood had to use a mixed dialect, as they had naturalised some words of the language of the Hindus. The Hindus, on the other hand, had adopted some of the expressions of the Mohammedans.

From the point of view of trade between States and within a State, English still continues to be the main medium of business communications. Since in most of the States the business is not necessarily confined to local people but is shared by many communities of other States, the use of English in business transactions is found to be practical.

While English will be an international link at all times, its place as an internal link will gradually be taken by Hindi which has been declared as the official language of the country.

QUESTIONS

1. Account for the great unevenness in the distribution of population in India. Is this unevenness a permanent feature? What are the economic-geographic effects of population densities in India?
—(Agra B. Com. 1953)

2. India has a population of more than 360 million. Analyse the factors which account for the irregular distribution of population in India.
(Cal. B. Com. 1953 ; Delhi B. Com. 1955).

3. Give geographical explanations for the uneven distribution of population in India. (Indian Institute of Bankers 1962).

4. Draw a map of India and show the density of population in the different regions. Critically analyse the pattern obtained.
(Cal. B. Com. 1961).

CHAPTER V

AGRICULTURAL PRODUCTION

Of the total area of the Indian Republic, the land available for cultivation is about 358 million acres which is about 33 per cent of the total land. The land available for cultivation *per capita* of population comes to 1·06 acres. The diagram on the next page shows the present position of the country in respect of her land and its utilization.*

India is essentially an agricultural country where nearly 70 per cent of the total population depend directly and another 15 per cent indirectly for their sustenance upon land. Thus agriculture is the largest single industry in India and it provides not only all the food grains and raw materials for inland consumption but also for export. *She is, to-day, the largest sugar-cane producing country in the world. In the production of rice, millets, tea, groundnut and linseed, her position is equally important. She holds a virtual monopoly in lac, follows the U.S.A. in cotton and Argentina in linseed, ranks with China and Africa as one of the chief millet-producing areas, and leads with China in the production of rice and tea.*

Indian agriculture is of vital importance to our growing population for food, to our industries for raw materials and to our foreign trade for earning foreign exchange.

From the point of view of total area under cultivation, India occupies the third place in the world being headed by the U.S.A. and the U.S.S.R.

Agricultural operations in India begin in June with the arrival of the monsoon. The crops raised in autumn as a result of the sowings made in June are known as the *Kharif* crops. The principal Kharif crops are wheat, rice, millets, maize, tobacco, jute, castor, groundnut, and cotton. Another

* Geographical, economic and cultural factors control land utilization. The geographical factors are rainfall, temperature, soil and relief which influence plant life. The economic factors are connected with transportation, density of population and the size of the market that can be supplied from a given area. The cultural factors include the stage of agricultural and industrial development, local prejudices, the system of land tenure and the Government policy.

agricultural season commences in winter, the *products* of which are known as the *Rabi* crops. The principal Rabi crops are

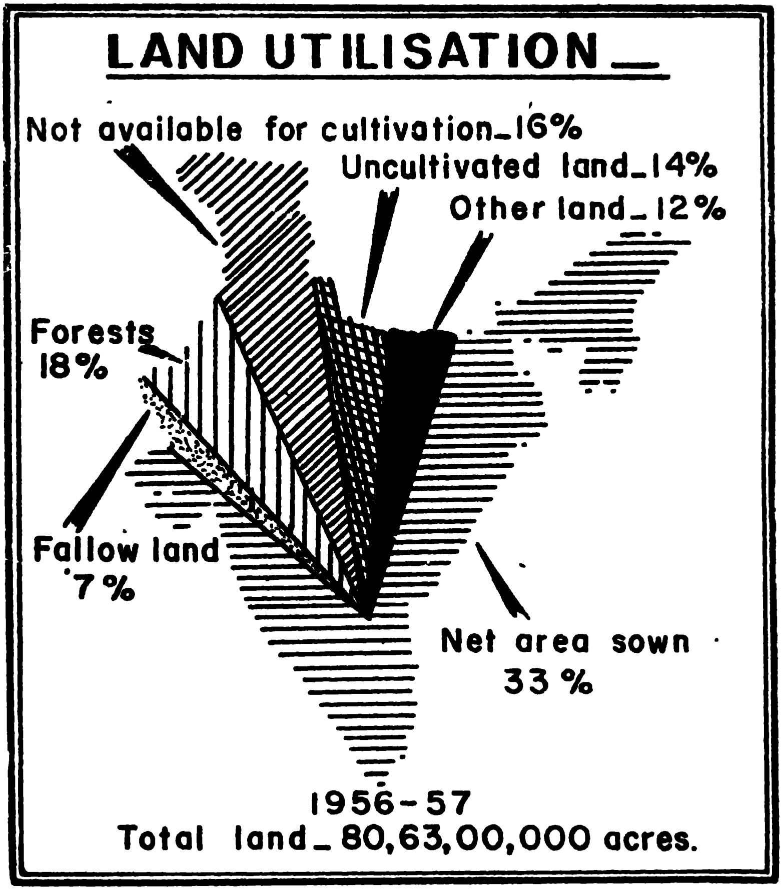


FIG. 10.

wheat, barley, gram, linseed, rape seed and mustard. Crops are classified in India as follows:

1. Food crops: (*a*) Food grains, (b) sugar, (*c*) condiments and spices, (*d*) fruits and vegetables, (*c*) other food crops.
2. Non-food crops; (*a*) Oilseeds, (*b*) fibres, (*c*) dyes and tanning materials, (*d*) drugs and narcotics, (*e*) fodder crops, (*f*) green manure crops and (*g*) other non-food crops.

Another classification is: (*i*) Food crops (*ii*) non-food crops and (*iii*) plantation crops—tea, coffee, rubber and coconuts.

There are mainly four types of agriculture in India, namely hill cultivation, wet agriculture, irrigation agriculture and dry agriculture. The variations are caused by her topography, climate, soil and types of population. When cropping is designed to ensure the production of cereals, fodder, vegetables and cash crop, the system is known as mixed farming. The rational pattern for agricultural development in India is the integration of animal husbandry and farming.

There are regions which are beyond the reach of irrigation facilities and which are frequently subject to drought. Neither canals nor tube-wells can supply water to them. They depend wholly on whatever little rain they receive. Hence comes in the importance of dry farming. Dry farming methods were first discovered in the U.S.A., where there are extensive areas receiving less than 20 inches rainfall per annum and having poor irrigation facilities. The following are the prominent features of dry farming: (*i*) ploughing the land in deep soil, (*ii*) terracing the land and division into compartments to allow rain-water to move only under controlled conditions, (*iii*) repeated harrowings before sowings, which conserve soil moisture and destroy weeds.

While studying agriculture one frequently comes across the term "plantation". Plantation ordinarily means tropical or sub-tropical agriculture which is engaged in producing "planted" trees or bushes. The products of the plantation agriculture in the Tropics and sub-Tropics are coffee, tea, bananas, sugar cane, sisal, cinchona and rubber. Its purpose is the production of a single crop on an extensive scale by efficient methods and in standard forms. It is also used in a narrow sense to denote those farms of the tropical lands where the capital, the skilled personnel, the machinery and sometimes even the labourers are brought from outside.

The cropping systems are also different in many regions. *Double-cropping* means that a field is replanted to a second crop after the first has been harvested. There may be also *multiple-cropping* when three harvests are obtained from the same field in the course of the year.

Though agriculture is practised throughout the country, there are certain areas which offer less opportunities for the cultivation of crops. The areas where the cultivation of land is difficult are: (*a*) Eastern Maharashtra and Eastern Madhya Pradesh—high lands are generally infertile soil, excepting the black soil; (*b*) Assam—unhealthy climate in several districts as well as dense forests and mountains restricts cultivation to definite areas; (*c*) Rajasthan, ar arid region where cultivation is extremely difficult; (*d*) the Himalayas where mountains prevent large-scale cultivation; (*e*) Madhya Pradesh and Orissa have areas where malaria is highly prevalent. All the same, cultivation of land in these areas is carried on in places which offer better conditions.

"Development of agriculture, based on the utilisation of man-power resources of the countryside and the maximum use of local resources holds a key to the rapid development of the country."* In India, agriculture is a very old industry and the cultivators are intelligent and hard-working—though poor. Indian cultivators do not hesitate to accept new ideas and new methods if they are intelligently explained and demonstrated. Their financial plight, however, makes them cautious and restricts their ability to undertake new practices that require even a modest investment.

Another problem is that the *agricultural productivity of India is lower than that of many other important agricultural countries of the world.* In terms of percentage, seventy persons grow agricultural produce for one hundred persons in India compared to U.S.A.'s 10 persons for 100 persons. There is urgent need for reducing this percentage by corresponding increase in production. In large tracts of Europe and U.S.A., the land yields more because it has been brought under cultivation comparatively recently. This should not lead us to conclude that agricultural productivity is dependent on the period under which land has been cultivated. For instance in China, where the agricultural industry is as old as that of India, the average yield is comparatively high.

This low productivity of land in India is caused by the (*a*) lack of assured and timely irrigation water, (*b*) the low level

* Third Five Year Plan, p. 23 (Government of India, Planning Commission.)

of soil fertility, and the general absence of fertilising practices, (*c*) use of indifferent seeds, and (*d*) losses due to incidence of diseases and pests.

COMPARATIVE YIELD OF CROPS PER ACRE
(BASIS 1954-56)

Countries	Wheat Bushels per acre	Rice lbs. per acre	Cotton lbs. per acre	Sugarcane (tons per acre)
U S A.	18	1390	270	—
France	26	—	—	—
Canada	17	—	—	—
Australia	18	—	—	21
China	16	2387	—	—
India	12	1258	83	15
Japan	—	2352	—	—
Hawaii	—	—	—	62

India's present yield per acre is one of the lowest in the world. Yet this situation is not due to climatic or soil limitations. In fact, in a few areas, yields have been increased in recent years by 100 per cent. Most of the methods which are required to increase the yield per acre are already known but little practised. Thus the proper dissemination of knowledge on wide scale is of prime importance. Also it has been estimated that crops grown in India remove from the soil annually 4·2 million tons of nitrogen, 2·1 million tons of phosphoric acid, 7·3 million tons of potash and 4·8 million tons of lime. In any scheme of crop production therefore, the efficient use of fertilisers is of great importance. Systematic efforts are being made to increase agricultural productivity in India. The following table gives an indication of the increase of yield per acre of certain important crops:—

AVERAGE YIELD PER ACRE (LBS) 1958-59 to 1960-61

Crops			Crops		
Rice		850	Pulses	...	480
Jowar	..	500	Cotton	...	94
Bajra	.	400	Sugar cane	..	3,330
Maize	.	771	Tobacco	..	645
Wheat	...	716	Oilseeds	...	476

Increase in agricultural productivity has been possible through irrigation schemes, clearance and reclamation of waste-lands, mechanical cultivation, chemical fertilisers and improved seeds.

It is necessary to mention in this connection of the effect of the size of agricultural holdings on the actual production. The Indian agriculture is conducted extremely on a small scale. The small size of agricultural holdings along with low yield per acre is forcing many cultivators to leave farming. The cultivated field per rural family is 7·5 acres. Compared with some European and American countries, the acreage under cultivation is very low, but when compared with Japan and Egypt, the size is very much higher.

AVERAGE SIZE OF HOLDINGS PER FAMILY
(1957)

Country	Acres	Country	Acres
India	7·5	Denmark	37·7
U.K.	66·3	Japan	2·0
U.S.A.	215·5		
New Zealand	491·0	Egypt	2·3

Whereas in Japan it has been possible to get very high yields per acre, because of the intensive cultivation and the increasing use of fertilisers, in India the yields per acre have remained very low for many years. The defects associated with small holdings are serious—but, with improvements in farm techniques and management through fertilisers and better seeds, a holding should give more yields per acre. All the same, the present size of unit per family is too small to provide a living for all the members of a family. Non-farm employment opportunities who have little work on land, will raise the income level. Also, there should be a minimum unit of land per family, which, of necessity, will vary in acreage according to the physical productivity of land. The productivity of land should be assessed in terms of irrigation facilities and distance from markets. There has been legislation for placing ceiling on agricultural holdings in Andhra Pradesh, Assam, Gujarat, Kerala, Madhya Pradesh, Maharashtra, Orissa, PEPSU territory in the Punjab, Rajasthan, Uttar Pradesh, and West Bengal and in the Union territories.

Bills are being proposed for ceilings in Bihar, Madras and Mysore. A problem that has arisen is the hesitation or withholding of private investment in agriculture because of the application of land ceilings. Many cultivators feel that they must know that their tenure will remain stable for a sufficient period of time to permit them to receive expected returns from investments in land improvement. Unless the concept of minimum unit of land is accepted, the influx of rural population into cities will continue and give rise to problems of health and housing in urban areas.

The third problem is the maladjustment of food resources to the growing population of India. This is however an old problem. The pre-partition production of food grains in India, even when supplemented by imports, fell short of the actual requirements of the country. There is now a food deficiency for about 12 per cent of the population in a year. At the rate of 18·3 oz. of food per person, India would require 110 million tons of food by 1965.

Of late, joint co-operative farming societies are being established. "The contribution of cooperative farming to reveal progress will be significant in the measure in which it develops as a voluntary mass movement and co-operation at the village level."* The ultimate success of joint co-operative societies will depend on how efficient the management is. The size of a co-operative farm should be such as to make for economic operation and to secure the development of the village economy as a whole. There is also need for alternative ways of accomplishing co-operation in farm operations. The owners of small units can arrange for joint ownership and operation of power, and for use of equipment.

AREA AND PRODUCTION OF PRINCIPAL CROPS (1959-60)

Crop	Area (thousand acres) Current Estimate	Production (thousand tons unless otherwise stated) Current Estimate
Rice ...	... 81,343	29,338
Jowar ...	... 41,602	7,866
Bajra ...	... 26,699	3,484

* III Five Year Plan.

AREA AND PRODUCTION OF PRINCIPAL CROPS (1959-60)—*Contd.*

Crop	Area (thousand acres) Current Estimate	Production (thousand tons unless otherwise stated) Current Estimate
Maize	10,457	3,615
Wheat	31,508	9,734
Barley	8,220	2,605
Gram	25,046	5,390
Other Kharif Pulses	16,075	1,567
Other Rabi Pulses	12,788	2,690
Sugarcane (Gur)	5,178	7,579
Tobacco	917	281
Groundnut	15,305	4,390*
Castorseed	1,178	108
Sesamum	5,510	392
Rapeseed & Mustard	7,167	1,025
Linseed	3,921	425
Cotton	19,252	3,835
Jute	1,707	4,548**
Mesta	706	1,098
Tea (1000 lbs.)	702	667,727

Many of our cultivable lands lie waste to-day because in the absence of roads, the farmer finds not only the cost of production high but also that of transporting charges. In France, U.S.A., Germany, U.K., and Israel, the agricultural prosperity came in the wake of road development. In India, however, many of the villages are still in isolation.

India and Her Food Supply

Food crops occupy about 86 per cent of the total acreage under crops in the Union. Although India is one of the greatest agricultural countries of the world, her position with regard to food production is not yet satisfactory. The food grain production in India during 1960-61 was about 70 million tons as against the Second Five Year Plan target of 80 million

* Nuts in shell.
** In thousand bales of 400 lbs. each.

tons. The Third Plan has accorded a very great degree of emphasis on the agricultural sector of our economy in order to "achieve self-sufficiency in food grains and increase agricultural production to meet the requirements of industry and export." India's annual increase of food production is 3·2 per cent (from 1953 to 59), which, if the gap between the needs for food grains and supply is to be made narrower, must be raised to 8·2 per cent per year for the next seven years. If the present low rate of increase continues, the gap between supply and needs in 1965-66 will be about 28 million tons.

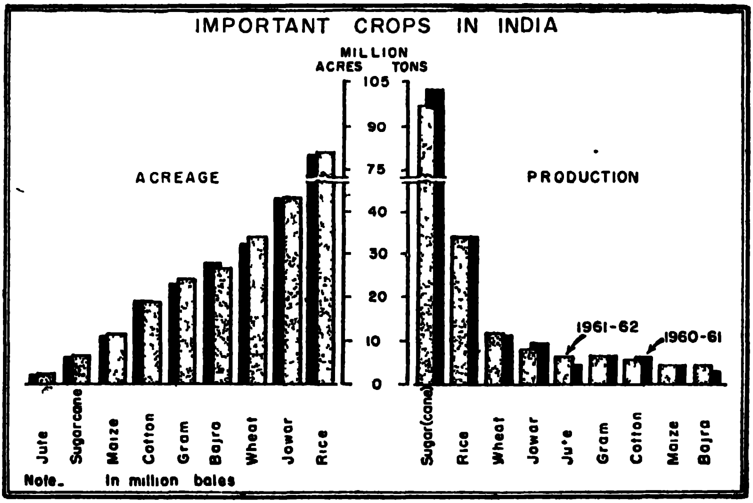


FIG. 11. The diagram shows the progress of Agricultural production from 1960-61 to 1961-62.

The food problem in India has been, therefore, viewed on a "war footing".

THE AVERAGE PRODUCTION IN THE SECOND AND THIRD PLANS

(in million tons)

	1956-57 to 1960-61	1961-62 to 1965-66
Food grains	70·9	86·8
Rice	29·3	39·4
Wheat	9·3	12·1

The target of the third Five Year Plan is 100 million tons a year. The soil, climate and physical resources of India can make it possible to achieve this target. "Although land is relatively scarce, the labour supply is abundant, and there are great potentialities for increasing production per acre. The problem is one of organising and combining resources to achieve the food production targets." Uttar Pradesh, Madhya Pradesh, Andhra Pradesh, Punjab and Bihar will account for more than 50 p.c. of India's total food grains.

The following table gives the estimates of increase in food grains during Third Plan in lakh tons:

	1960-61	At the end of Third Plan
Andhra Pradesh	62·96	87·69
Assam	16·60	21·89
Bihar	62·62	82·89
Gujarat	21·16	29·47
Maharashtra	62·66	79·98
Kerala	10·42	14·42
Madhya Pradesh	90·74	107·42
Madras	51·72	68·26
Mysore	38·50	48·54
Orissa	40·00	56·15
Punjab	60·00	78·50
Rajasthan	50·35	66·35
Uttar Pradesh	135·39	182·84
West Bengal	52·24	66·73
Jammu and Kashmir	4·83	5·83
Union Territories	7·15	8·20

With a view to encouraging strict control on the food grains economy and ensuring fair level of prices both to the producers and the consumers the Central Government in 1958 decided upon the policy of State trading in food grains. In accordance with the scheme wholesalers and millers were licensed throughout the country, and the Government purchase operations were extended to deficit and marginally placed areas.

Imported food continues to play an important role in meeting India's food deficit.

Imports of Cereals into India
(000 tons)

Grain	Country	1957	1958	1959	1960-61
Rice	Burma	476	384	290	331
	U.S.A.	194	—	—	253
	China	14	—	—	—
	Pakistan	12*	—	—	—
	Burma (through U.S.S.R.)	33	—	—	—
	Viet-Nam	7	7	—	—
	U.A.R.	—	—	—	104
Total Rice		736	391	290	688
Wheat	U.S.A.	2,674	1,898	3,127	3,976
	Canada	11	760	274	24
	Australia	167	15	96	317
Total Wheat		2,852	2,673	3,497	4,317
Others	U.S.A.	—	109	20	51
Total Cereals		3,588	3,173	3,807	5,056†

* Return of loan.
† The high level of imports during 1960 is due to the fact that a part of these imports has been used for building up the proposed reserve of five million tons.

The food grains are imported from U.S.A., Canada, Australia and Burma. The food deficit in India can be largely made up by reclamation of waste land, increased supply of water through irrigation, use of good seed, use of chemical manures, use of machinery to bring new or difficult land under cultivation, by anti-malarial measures to improve the health of peasants and change in food habits for greater consumption of subsidiary food.

India has eighty-five million acres of such land which is not being put to any use. A large part of it is marginal or sub-marginal. At least ten million acres out of this area is good, fertile and cultivable.

Reclamation schemes are in progress in many States. The Uttar Pradesh Government has carried out some of the biggest reclamation schemes in Asia except Russia. In Ganga Khadir, in the Meerut district, a jungle-covered tract of nearly 47,000 acres, has been cleared and sown. In the marshy areas of Terai nearly 50,000 acres of useless land have been brought under the plough. In Madhya Pradesh the reclamation of land infested with the dreaded *kans* is one of its many outstanding performances. The reclamation operations were started in 1948.

Kans, with its roots going down to a depth of fourteen inches, was considered to be an ineradicable difficulty and the villagers had misgivings about the success of reclamation operations. Slowly as the work proceeded their apathy was transformed into active cooperation and enthusiasm. The crops produced in the reclaimed land are found to be definitely superior to those in other areas. Between 1948 and 1960, about 1·8 million acres of land have been reclaimed for cultivation.

Mechanisation of agriculture in India is not essential as there is no dearth of agricultural labour. In the temperate grasslands of North America and U.S.S.R., mechanisation has succeeded because of the paucity of farm labour and the consequent high price of it. Mechanisation gives higher yield per man and not per acre. In India therefore, total mechanisation would be unwise. However, it may be applied for breaking new land. In China and Japan, too, mechanisation methods are not universally used.

India has also several million acres of cultivable waste land infested by mosquitoes and malaria. It is possible to make these areas agriculturally fit and malaria-free. Rice-growing areas in India are coincident with endemic malarial tracts. There are several tracts in India which are very fertile but have remained mostly uncultivated because of the hyper-endemic malarial conditions. Such tracts are (*a*) a horizontal strip of sub-Himalayan tract—*terai,* (*b*) a vertical strip along the Western Ghats and (*c*) a strip along the Eastern Ghats enlarging into a wide belt at the top merging into Madras, Orissa, Madhya Pradesh and Andhra. In all these areas, rice cultivation may be very profitable as the rainfall is between 50″-100″ per year. Malaria affects man but not the soil. Mosquitoes and rice plants are both sub-aquatic—one is aquatic fauna and the other is aquatic flora. They grow under the same conditions of high temperature, high humidity and heavy rainfall. It is possible to control mosquitoes and suppress malaria and to grow more rice to feed the country. Thus, as a short-term programme, efforts should be made to increase the production of rice by controlling malaria.

The whole of the country in the south between the Ghats and the sea-coast from Goa to Cannanore can also be developed to yield food crops. This region is known as *Malnad.* The

chief characteristics of the region are the following: (*a*) the rainfall is invariably over 60 inches; (*b*) the area is full of evergreen forests; (*c*) the density of population is below the average of 200 to 300 per square mile. The chief crops are paddy, betel nut, cardamom, pepper and coffee. In spite of the great geographical advantages of the Malnad area, it is at present in a backward position. The reasons are many—such as excessive rainfall, unhealthy climate, prevalence of malaria, inadequacy of communication and scarcity of labour. If these problems are solved, Malnad will contribute substantially towards the production of food grains in the country. The use of tractors will enable the now inaccessible lands to be brought under cultivation.

There is a project to develop the desert tracts of Rajasthan by constructing a canal which will run through the Punjab and then enter Rajasthan territory. This will be one of the biggest irrigation projects of the world. The Rajasthan canal

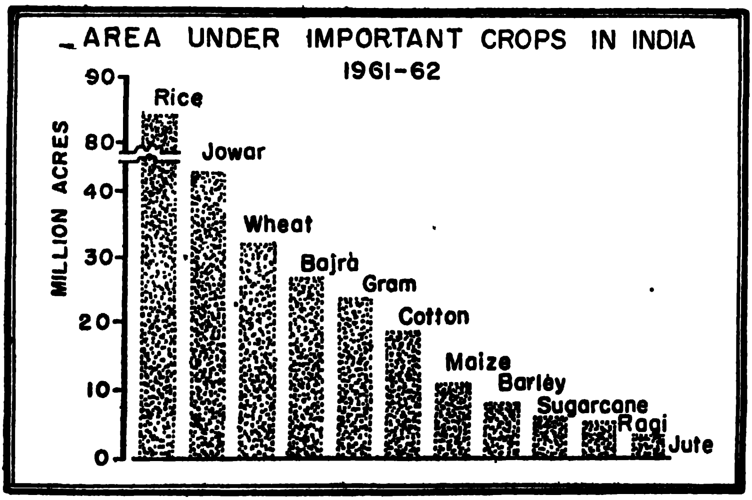


FIG. 12. Area under important Crops 1961-62.

with a capacity of 18,500 cusecs at head will take off from the Harika barrage on the Sutlej, just below its confluence with the Beas. The canal will go as far as Jaisalmar district through Bikanir. The Punjab portion of the canal will do no irrigation and will serve only as a feeder. About 3·36 million acres

of land will be available for cultivation. The extension of irrigation will also arrest the advance of the desert into western U.P.

It is also necessary to pay more attention to subsidiary foods like bananas, tapioca and sweet potatoes. Some time ago, the Government of India set up a *Subsidiary Food Production Committee* for the purpose. The Committee recommended increased production of sweet potatoes, tapioca, and the utilization of groundnut cakes. The 3½ million tons of groundnut produced in India can yield 2 million tons of finest food equivalent in protein value to over 2,400 million gallons of milk. Tapioca as a staple diet is unsatisfactory because of a deficiency in the quantity and possibly the quality of its proteins. The present tendency in certain parts of India to foster consumption of tapioca at the expense of that of other foods, such as rice, is undesirable from the standpoint of nutrition. Analysis shows that tapioca contains only 0·7 per cent protein against 6·4 per cent in rice, 12·1 per cent in whole wheat flour, 11·6 per cent in bajra, 11·5 per cent in barley and 11·1 per cent in maize. Tapioca is also poor in carbohydrates and fats. The total acreage under tapioca is about 634,000 acres of which 582,000 acres are in Kerala and the rest in Madras. Tapioca's popularity appears to be based on its high yield, about three to five tons per acre which with careful cultivation can be raised to 15 tons per acre. It can thrive in relatively dry weather. Then again, sufficient attention has not been paid to banana cultivation both for internal consumption and foreign markets. Not only is this article consumed throughout the country, its demand is considerable in foreign markets. The question of subsidiary foods should receive serious attention from the point of view of improving nutrition and making for a better balanced diet. The use of non-cereal food will not only reduce the demand for cereals but will also release land for the production of other foods

Rice

The first mention of rice in India occurs in the Atharva Veda as early as 1,000 B.C. It is at present the most important crop in India, covering as it does nearly 30 per cent of India's

sown area. India is the second largest rice-producing country in the world.

Rice thrives best in high temperature and abundant moisture and the crop is generally grown in fields susceptible of being flooded at certain stages of its growth. Hence the greatest areas under rice are found in river deltas, in low-lying coastal districts and in tracts subject to floods during the monsoon.

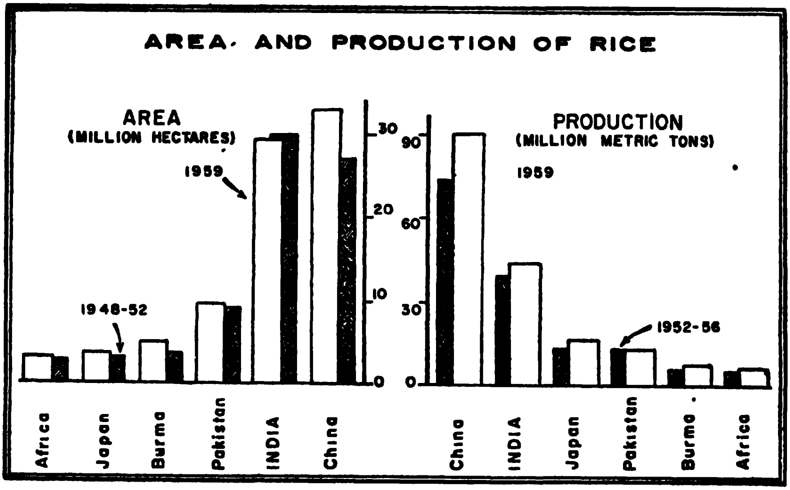


FIG. 13. Acreage and Production of Rice in India *vis-a vis* the World Production.

In Madras, there are three rice crops in the year, known as the *Aus* (autumn), *Aman* (winter) and *Boro* (summer) according to the season in which they are harvested. The winter crop, most important of all, is sown between June and August, and harvested between November and January. The autumn crop is sown in March-July, and harvested in September-October. The summer crop is sown between November and January and harvested in March-May. Rice can also be grown in hill-tracts if the supply of water is abundant, and the summer, warm. "For the purposes of cultivation, the hill-sides are cut into terraces which are levelled off and embanked by means of bunds in order to retain the moisture obtained from nearby streams or from rainfall."

In Madhya Pradesh only one rice crop is cultivated. This is sown in May-June and harvested in September-November.

TIME OF SOWING AND HARVESTING OF RICE IN DIFFERENT AREAS OF INDIA

Regions	Winter Rice		Autumn Rice		Summer Rice	
	Sowing	Harvesting	Sowing	Harvesting	Sowing	Harvesting
Bengal .	May-July	Oct.-Jany.	March-July	June-Sept.	Oct.-Jany.	Feb.-April
Bihar ...	June-August	Nov.-Dec.	May-July	August Oct.	Sept.-Nov.	Feb.-March
Madras . .	June-Oct.	Dec.-March	.	. .	Dec.-March	April-May
Punjab ...	March-August	Sept.-Nov.	...	...	. .	..
U.P. ...	June-August	Sept.-Dec.	...	...	..	...
Gujarat ...	May-Angust	Dec.-Jany.	. .	...	. .	..
Kashmir ...	...	...	April-May	Sept.-Oct.	...	...
Mysore ...	June-July	Nov.-Dec.	...	...	Feb.	April-May
M.P. ...	June-July	Nov.-Dec.	June-July	Oct.	...	...
Kerala ...	Sept.-Oct.	Jan.-Feb.	April-May	Sept.-Oct.	Jany.-Feb.	April-May
Andhra ..	June-July	Nov.-Dec.	...		Nov.-Jany.	April-May

RICE: AREA AND PRODUCTION (ESTIMATE 1959)

State			Area (000 tons)	Production (000 tons)
Andhra Pradesh	. .	...	7,104	3,225
Assam	...	...	4,313	1,705
Bihar	...	...	12.528	3,885
Maharashtra	..	...	4,013	1,506
Madhya Pradesh	...	...	9,547	3,146
Madras	...	...	5,538	3,103
Orissa	...	...	9,325	2,138
Uttar Pradesh	...	...	9,533	2,267
West Bengal	...	...	10,060	4,335
Total	...	...	78,174	28,142

Rice is sown in India in three ways—by broadcast, by drill and by transplantation from a seed-bed. The first method is practised where labour is scarce and the soil infertile. The

second method is mostly confined to Peninsular India. The third method is common but it requires a plentiful supply of labour, because the seed-beds are to be highly manured before the seeds are sown. After four or five weeks, the seedlings are uprooted, tied into bundles and carried to the field where they are again planted by hand. The transplanting of the young plants from seed-beds to fields, cutting the rice with sickle and the husking of the grain—all involve much manual labour.

The monsoon greatly influences rice production in India. Its failure has much adverse effect on the output, because water is the principal factor in its cultivation.

The principal rice-growing areas of India are, in order of importance, West Bengal, Andhra, Madhya Pradesh, Bihar, Madras, Uttar Pradesh and Orissa. These areas account for about 95 p.c. of the total rice acreage in India.

The food problem of India is mainly a rice problem as two-thirds of the population depend on rice as their staple diet. Rice covers about 22 per cent of the total cropped area. From the inception of the First Plan period, the production of rice has been on the increase. In 1960, the production was 29 million tons compared to 27 million tons in 1955.

The yield per acre of rice is influenced by a number of factors, such as rainfall, irrigation and soil, which are liable to vary from place to place. It also varies according to season. Summer rice generally gives the largest yield and autumn, the smallest. West Bengal has the highest yield per acre of rice.

RICE YIELD PER ACRE: 1958-59 to 1960-61

Andhra ...	... 1,130	Bihar ...	... 747
West Bengal	... 1,925	Punjab ...	... 874
Assam ...	... 850	Rajasthan	... 875
Madras ...	... 1,323	Kerala ...	... 1,323
Madhya Pradesh	... 731	Mysore ...	... 1,187
Maharashtra	... 850	Average ...	... 850

Because of improved methods, and a higher degree of mechanisation, the yield per acre has gone up in most of the areas in recent years. It may be noted that increase in yield per acre rather than increase in area brought about increased production of rice in recent years. The average yield per acre

is to-day 850 lbs. and this figure compares very unfavourably with those of U.S.A., Japan, Egypt, and Italy where the yields per acre are 3,060 lbs, 4,291 lbs, 3,000 lbs. and 4,728 lbs. respectively.

Almost in every district of West Bengal rice accounts for more than 60 per cent of the sown area. About 10 million acres of land are under rice cultivation in West Bengal with approxi-

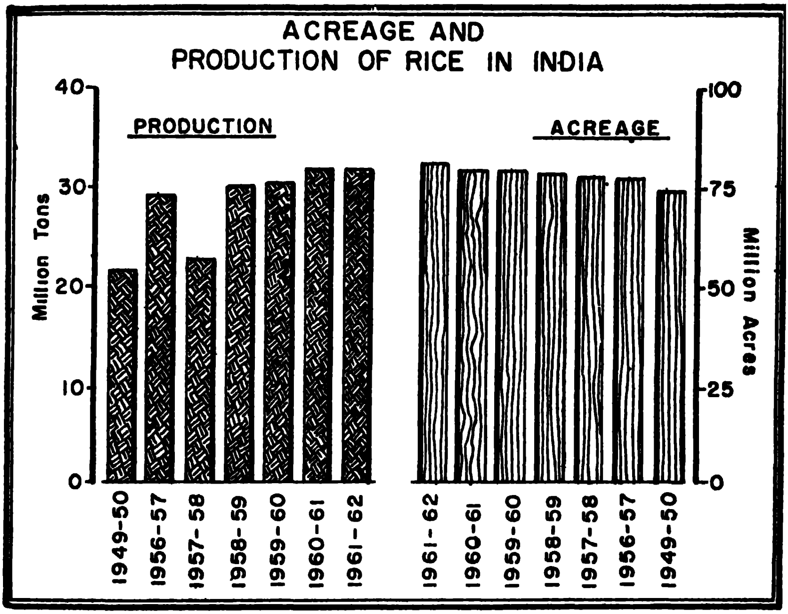


FIG. 14. Acreage & Production of Rice in India

mately 4 million tons of rice as annual yield. Other areas where rice crop covers over 80 per cent of the sown area are Cuttack, Puri and Sambalpur in Orissa; Kamrup and Goalpara in Assam, and West Godavari, Chingleput, Tanjore and Kanara in the south-east.

Although India has increased her rice production, imports of rice cannot be dispensed with even now. In 1960-61 she imported 580,000 tons of rice, from Burma and U.S.A.

Only about 30 per cent of the rice production is the marketable surplus, and the rest is consumed in the growing areas. West Bengal has a normal deficit of 300,000 tons. Madras,

Bihar, Gujarat and U.P. have larger deficit but in these States, wheat is the staple food crop. Assam, Madhya Pradesh and Orissa normally have marketable surplus.

There is a large scope for further cultivation of rice in India, particularly in West Bengal, Bihar and Orissa. The three multi-purpose projects in the Damodar, Koshi and Mahanadi aim at making millions of acrės of land cultivated. Production of rice can be increased in the country by 50 per cent through improved varieties and better manuring.

Of late, considerable interest has been evinced by the general public in the Japanese method of rice cultivation.* In Japan, where the fertility of land on which paddy is grown, is not very high, the farmers get twice or thrice as much as our normal yields because of their following a system of cultivation which is highly systematic, and which involves the addition of adequate organic manures, application of fertilisers at proper times and at the proper stage of the growth of the crop, and the labour that the farmers put in by way of interculturing and weeding. In various States, both the methods are in operation to-day. In 1959, about 6 million acres of land were under Japanese method of rice cultivation.

METHOD OF RICE CULTIVATION (1958)

(yield per acre in lbs.)

	Local method	Japanese method
Assam ...	2,057	3,703
Madhya Pradesh	1,522	2,296
U.P. ...	1,809	2,348
Orissa ...	623	2,633
Punjab ...	1,113	1,958
Andaman ...	987	2,633

Hybridisation between Japonica and Indica rice is being worked out at various places, though on a limited scale. The

* The chief features are: (1) use of less and better seed; (2) sowing the seed in a raised "nursery" bed; (3) transplanting the seedlings in rows to make weeding and fertilizing easy; (4) use of natural and chemical fertilizers —compost, green manure, and ammonium sulphate.

Japonica varieties are high-yielding, give a better percentage of rice to paddy and respond to intensive manuring, while Indica group germinates quicker and is resistant to drought and diseases. It is estimated that if only 3 per cent of India's total irrigated paddy area is cultivated by this Japanese method, India need no longer import rice. Even with improved methods, deficit in rice production may be possible because of climatic vagaries. Since there are people who would not accept any other cereal for normal rice diet, the Central Food Technological Research Institute at Mysore is engaged in a planned production of "synthetic rice", which is made from a mixture of a small percentage of wheat, tapioca flour and groundnut meal. This synthetic rice is cooked by the same process as natural rice.

Wheat

Wheat has been cultivated in India from time immemorial. Grains unearthed from the 3,000 year-old ruins of Mahenjodaro in the Indus Valley have been identified as *Triticuma Compactum*, a type of wheat cultivated in South-West Punjab.

Wheat is the staple food of the people in Punjab and Uttar Pradesh.

Wheat requires a large amount of heat for its grain to ripen; but the necessary period of heat need not be very long as the grains ripen quickly. At the sowing season, wheat requires water but too heavy rain like that of West Bengal, Assam and eastern parts of Madras is unfavourable to its cultivation. The plant can endure extreme dryness provided there is provision for minimum supply of water by rainfall or by means of irrigation. In Punjab and the Uttar Pradesh, where the rainfall is very small and never exceeds thirty inches per annum, wheat cultivation has become very successful with the help of irrigation.

In India there are two principal varieties of wheat: the *normal bread wheat* and the *macaroni wheat*. The first type grows as an irrigated crop in Punjab and U.P. and thrives best on soils of the clayey type. The second type is grown as a rain-fed crop on the clayey black soil of Maharashtra, Madhya Pradesh and the western part of Andhra.

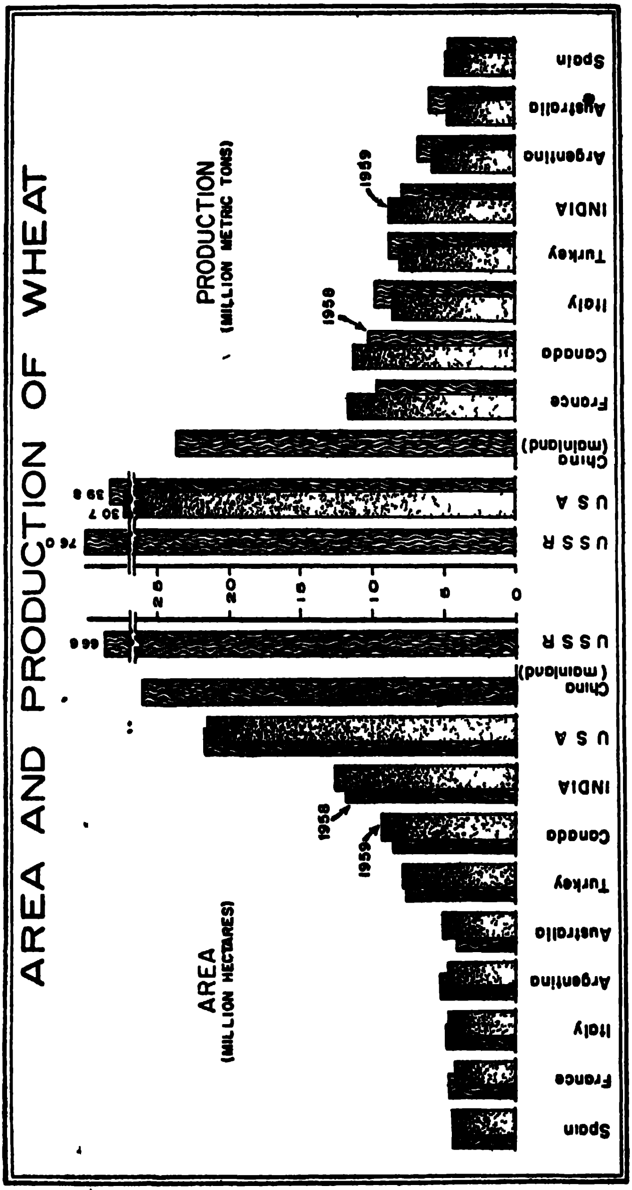


Fig. 15. Wheat in India *vis-a-vis* World Production.

Wheat grows in two seasons—in winter and spring. The *winter wheat* requires low temperature in the early stages of growth and can stand winter cold to mature in summer months. The winter wheat, therefore, takes a long period to grow. The *spring wheat* is sown in April and harvested in August. In India, most of the wheat is grown in winter.

In Punjab and Western U.P., the bulk of the crop is generally sown by the end of November. In the Uttar Pradesh and Bihar it is generally grown in late October or early November, while in the Deccan and parts of Maharashtra State, the crop is sown between September and the middle of October.

Wheat in India takes 4 to 6 months to ripen as against nine to ten months in some western countries. In the south the growing period is shorter than in the north. The harvesting may begin at the end of December in the south, while in Madhya Pradesh, it commences normally in March. In western U.P., Delhi and Punjab, harvesting is normally in full swing by the end of April. In the hilly regions of northern India, the growing season for wheat is about nine months.

TIME OF SOWING AND HARVESTING OF WHEAT IN DIFFERENT AREAS IN THE INDIAN UNION

Regions	Sowing	Harvesting
Bihar	Oct.-Nov.	March-April
Maharashtra	Oct.-Nov.	March
Madhya Pradesh	Oct.-Nov.	Feb.-March
Punjab	Oct.-Dec.	March-May
U.P.	October	March-April
West Bengal	Nov.-Dec.	Feb.-April
Gujarat	Oct.-Nov.	March-May
Kashmir	Oct.-Dec.	April-May
Mysore	October	February

In 1960, wheat area covered 31·3 million acres of land and produced about 9·8 million tons of wheat. Since 1950, the production of wheat has been increasing every year though at a slow rate. This increase has been due to the increase in area

under crop than the increase in yield per acre, though in U.P. the yield per acre has contributed to increased production.

GEOGRAPHICAL DISTRIBUTION OF
WHEAT: Area and Production (1960-61)

State	Area (000 acres)	Production (000 acres)
Bihar	1,822	153
Maharashtra	3,462	570
Madhya Pradesh	7,448	1,604
Punjab	5,140	2,114
Rajasthan	3,279	1,190
Uttar Pradesh	9,991	3,139
Total	32,891	9,068

The third Plan aims at increasing the average annual production of 9 million tons to 12 million tons a year from 1961-62 onward.

	Wheat Production in India (in million tons)
1958-59	9·8
1959-60	9·7
1960-61	10·0
Average Annual 1961-62 to 1965-66	12·1

Ploughing and sowing, harvesting and threshing call for a large amount of manual labour and therefore it is cultivated on a large scale in those areas where a large force of labour is available. India grows less than one acre of wheat for every ten persons. Canada and Australia, on the other hand, have two and a half acres for each member of population. Continental countries, *e.g.*, France and Italy, have one acre of wheat for every three persons, and the United Kingdom has one for four.

Wheat is cultivated in India in rotation with other crops like sugar cane, gram or cotton, depending on the amount of rainfall and soil. In the irrigated areas of Punjab and northern

U.P., wheat is often rotated with sugar cane and cotton. In Madhya Pradesh and Maharashtra groundnuts and linseeds are cultivated in rotation with wheat. "Where rainfall is high, the

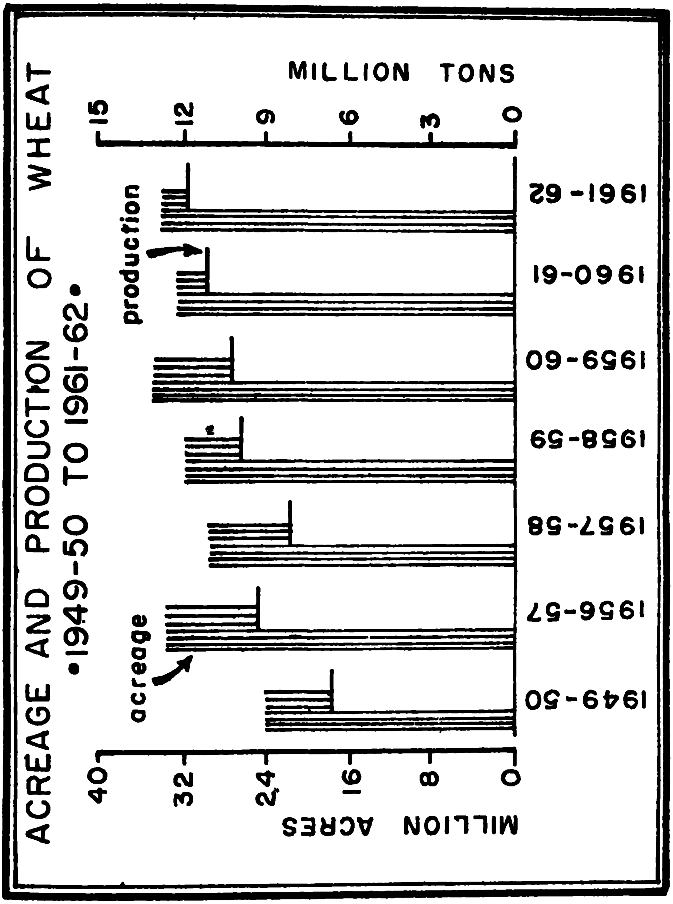


FIG. 16. Acreage and Production of Wheat in India.

common practice is to grow wheat in one year, gram in the second year and a non-cereal crop in the third year." Thus, production of wheat is often fluctuated because of the rotation of crops in India. The average yield of wheat per acre in India is 716 lbs. The following table shows the average yield of wheat in certain States.

WHEAT: AVERAGE YIELD PER ACRE
(1958-59 to 1960-61)
(lbs. per acre)

Uttar Pradesh	707	Andhra	224
Madhya Pradesh	395	Assam	538
Bihar	408	M.P.	395
Maharashtra	413	Mysore	202
Rajasthan	506	Orissa	560
Punjab	854	West Bengal	627
		All India	716

During the Third Plan period, the average yield is expected to go up to 795 lbs. per acre in India. The difference in yield per acre is due to the condition of water supply. The areas which are served by irrigation produce the higher yield while the area which depends only on rainfall has a lower yield. At present nearly one-third of the total land area in the country is under irrigation. In the Punjab, western U.P. and Rajasthan, the cultivation of wheat depends on irrigation. It is a rain-fed crop in Bihar and the eastern part of U.P.

In India the average yield of wheat per acre is abnormally low compared with the European and American countries. Other producing countries use machinery, grain elevators, better seeds, etc., which help to increase enormously their outturn per acre. Though poor, the Indian cultivators are receptive to new ideas. With credit facilities and technical services along with measures for soil conservation, the Indian cultivators will be in a position to increase the average yield per acre.

In U.P. wheat is cultivated more or less throughout the State and the rich producing districts are Dehra-Dun, Shaharanpur, Muzaffarnagar, Meerut, Moradabad, Etawah, Shajahanpur, Budaun and Nainital, where more than 30 per cent of the area is under wheat. The basin of Narmada in Madhya Pradesh is also a rich wheat region. Although the monsoon discourages the wheat cultivation in West Bengal, about 160,000 acres are under wheat in Murshidabad and parts of Nadia.

Nearly ·45 per cent of Indian wheat is consumed in the growing areas and the remaining 55 per cent is put on the open market.

The scope for further production of wheat is indeed great in Punjab and U.P. and therefore if the target envisaged in the Third Plan is achieved, no imports of wheat may be necessary after 1966.

Millets

Millet is a short season crop and is grown generally in Madras, Maharashtra and the adjoining districts of Andhra. It flourishes best in hot lands which are fairly dry. It can be grown without irrigation even in areas where rainfall is scanty.

There are two varieties of millets in India—Jowar and Bajra.

Jowar

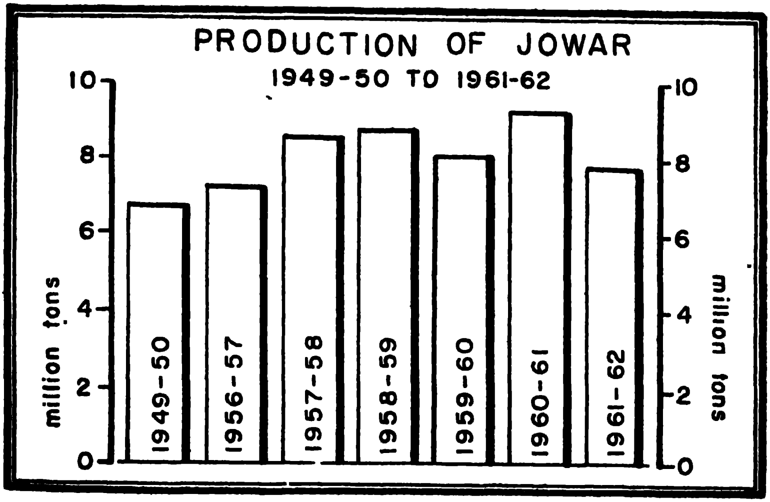


FIG. 17. Production of Jowar 1949-50 to 1961-62.

Jowar is extensively cultivated in the Deccan, and also to some extent in other dry parts of India. The area under cultivation in 1960 was 41 million acres and the yield was 8 million tons. Gujarat, M.P. and Andhra account for more than 50 per cent of the total acreage under jowar in India. Other areas are Central Rajasthan and Uttar Pradesh. In the Sholapur

district of Maharashtra more than 60 per cent of the sown area is under jowar. In Poona and Belgaum districts, the acreage under jowar accounts for more than 50 per cent of total area. Jowar is commonly called *Sorghum* in Europe and America. In India, the product is of great importance both as food and as fodder. The average yield is about 600 lbs per acre.

Bajra

Bajra is a short season crop and is grown generally in poorer soils. It is less widely cultivated and is essentially a village food crop. Maharashtra, Madras, Punjab, Gujarat, Andhra, and Rajasthan are the principal producers. The area under cultivation is about 28 million acres and the yield amounts to about 4 million tons. The average yield is 450 lbs per acre. More

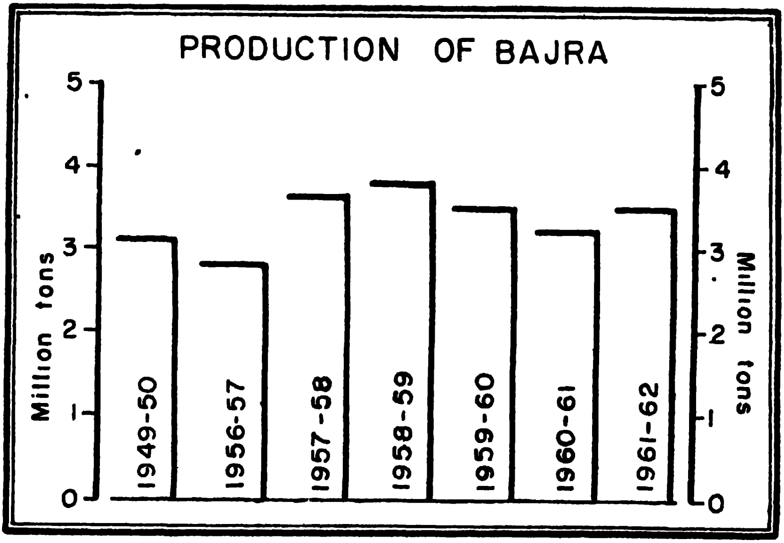


FIG. 18. Production of Bajra 1949-50 to 1961-62.

than 50 p.c. of the acreage under bajra is confined to Gujarat, Rajasthan and U.P. In Bhavnagar (in Gujarat), bajra covers more than 60 per cent of the sown area.

One-fourth of the total production of millets is exported and the destinations are Sudan, Arabia, Netherlands, Germany, East Africa and Aden. More than 90 per cent of the millet is shipped from Bombay.

Barley

Barley resembles wheat in general appearance and manner of growth, and thrives on scanty moisture supply. If, in any year, rainfall is below normal for wheat cultivation, barley is

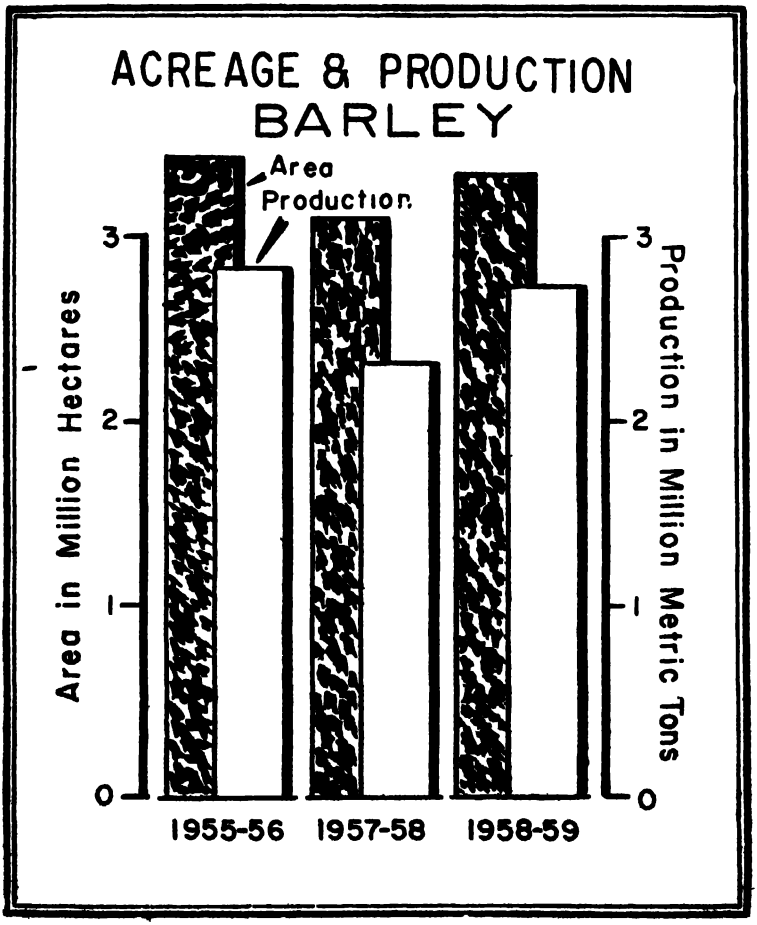


FIG. 19.

substituted. Light and sandy soils are the best for barley. It can be cultivated even in alkaline soils. It is a winter crop in India and is sown in October and November. The harvesting season begins from the third week of March and is completed by the middle of April. Barley has a very short period of growth compared to wheat or gram. "Whenever owing to an unfavourable season it is too late to sow gram or wheat, the farmer generally puts down barley as a cash crop."

India raises nearly 5 per cent of the world's total barley. It is mainly grown in Northern India and the U.P. has the largest acreage. The Republic has an area of about 8 million acres under barley with an average annual production of about 3 million tons. In U.P. the crop is relatively important having about 9 per cent of the total cropped area under it. Its cultivation is very extensive with the Ganga basin of the U.P., particularly in the districts of Banaras, Jaunpur, Gazipur, Gorakhpur, Allahabad, Balia, Pratabgarh, Azamgarh and Garhwal. Its cultivation also covers a large percentage of the total sown area in Saran, Champaran and Muzaffarpur in Bihar. In Bihar, the area under barley works out to about 5 per cent of the total cropped area. Thus the two chief zones of barley production are (*a*) north-western districts of Bihar and the adjoining north-eastern districts of U.P. and (*b*) the south-eastern districts of Punjab and the adjacent districts of U.P. The internal demand for barley is so high that exportable surplus cannot attain considerable dimensions. Consequently, India's share in the international trade of barley as an exporting country has been very small, amounting to a half per cent of the total world exports in recent years.

Maize

Maize is found more or less all over India, but Northern India raises the major portion. Maize requires high temperature and much more summer rain than wheat. The soil should be rich and well drained. Most of the maize is grown in regions with an annual rainfall of at least 20 inches. The total area under maize is 9 million acres with a production of about 4 million tons a year. The average yield of maize is 760 lbs. per acre.

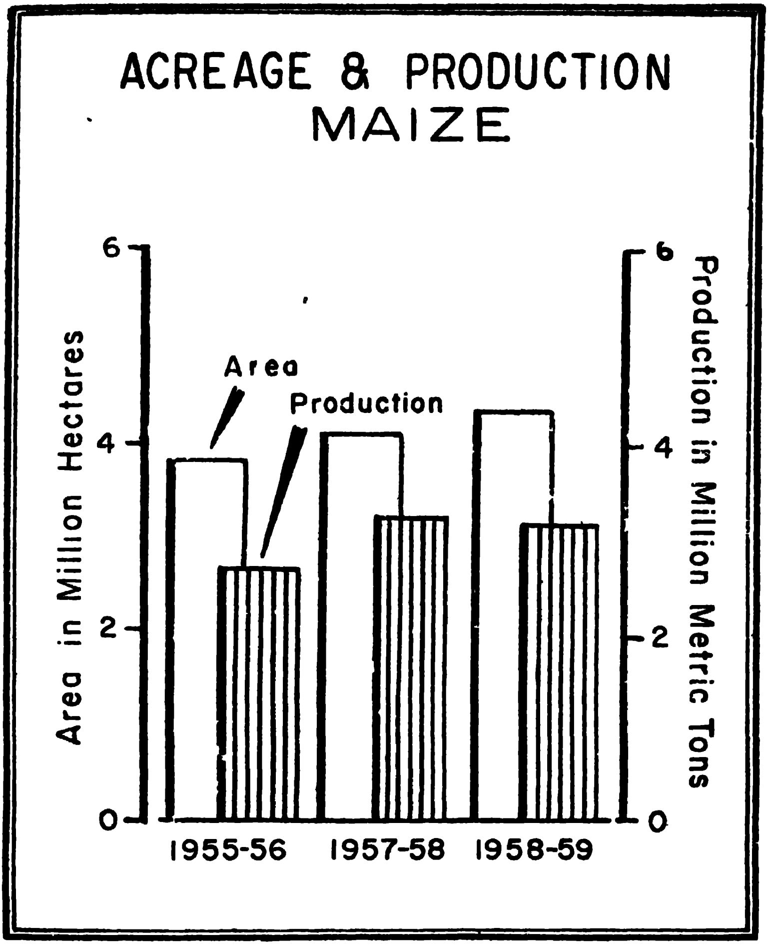


FIG. 20.

GEOGRAPHICAL DISTRIBUTION OF MAIZE:
Area and Production (1960)

State		Area (000 acres)	Production (000 tons)
Bihar ...	...	1,449	401
Madhya Pradesh	...	1,048	186
Punjab ...	...	1,009	651
Rajasthan	...	1,230	313
Uttar Pradesh	...	2,513	979
Total ...	...	9,244	3,020

In 1960-61, the estimated production went up to 'about 4 million tons. There has also been an expansion in the acreage under cultivation by about 1 million. The average yield per acre between the period of 1959 and 1961 was 771 lbs with the highest yield of 1024 lbs in the Punjab.

The U.P., Bihar and Punjab are the leading producers. Maize cultivation is practised throughout U.P. and Bihar, although the Upper Ganga valley has a large acreage. North-Eastern Punjab and South-Western Kashmir are also rich producing areas.

The crop is raised mainly for consumption in the areas of production, and exports are never considerable. India exports an insignificant quantity of maize, a little more than 200 tons. Exports are mainly from Bombay and Calcutta. Bombay alone sends more than 50 per cent.

In recent years certain industrial firms in India have developed the production of starch and glucose from maize.

Pulses

Pulses include food grains like gram, arhar, lentils or masur, etc. These grains are raised in different parts of India and consumed mostly in the areas of production. These grains are important both from the point of view of husbandry and of nutrition. Their nutrition value is great as a source of protein. Pulses constitute an important foodstuff not only for villagers but for animals as well. They are also grown as rotation crops to restore the fertility of the soil. Since 1949-50, the production of pulses in India has been increasing every year. The average yield went up from 361 lbs. per acre in 1950 to 540 lbs. in 1959. In 1960-61, a little more than 54 million acres were under the cultivation of pulses with 12 million tons of production compared to 9 million tons in 1950.

Gram is the most important pulse and is grown extensively in the Uttar Pradesh. Other producing areas are Punjab and Madhya Pradesh, Maharashtra and Mysore. The annual output is nearly 6 million tons and the acreage is 24·8 millions. Gram is often cultivated in combination with wheat.

The percentage of acreage is greater in Southern Uttar Pradesh (between Agra and Mirzapur), North-East Punjab,

Central Bihar, South Mysore and in North-Eastern part of Madhya Pradesh. As a foreign exchange earner it is of little significance since the internal consumption of gram leaves hardly any surplus for export.

Lentil or *Masur* is grown particularly in the Madhya Pradesh, Madras and the Uttar Pradesh, though in other States its cultivation is not uncommon. "*Arhar* is one of the most important foodstuffs of the countryside and is generally grown as a mixed crop, particularly in rotation with cereals." The annual production of these two pulses is very considerable. The exports of pulses are made to the U.K., Ceylon, Mauritius, Burma and France. Calcutta, Madras and Bombay participate in the export trade.

Tea

Tea. India is the largest tea-producing country in the world. The region of Indian tea-cultivation is a wide one. Beginning with the Himalayan plantations in the Punjab near 33°N. latitude, it extends to the Peninsular India between 10° and 13°N. latitude. The principal belt of tea-plantations lies between 23° and 32°N. latitude.

Tea-plant requires a deep fertile soil, which must be exceptionally well-drained, so that there may not be stagnant water on it. It is, therefore, generally grown on hill-sides. High temperature is essential for tea-cultivation.

There are two principal tea-producing regions in India, namely, North-East India and South India. The North-East India includes the Assam valley, the Surma valley or Cachar, Darjeeling, Dooars and Tarai and Tripura. Although Assam is surrounded on all sides by mountains, it is a level plain and has the largest concentration of tea in the world. Cachar is full of small hillocks. Darjeeling is a hill district and grows tea at a height of 1,000 ft. to 6,000 ft. Seventy-five per cent of Indian tea is obtained from Assam and West Bengal. The second tea-producing region is South India which is also an important tea-producer and contributes nearly 20 per cent of the Indian output.

In 1960-61, the tea production was 725 million lbs. The estimated production in 1965-66 under Third Plan will be 900 million lbs. which means an increase by 24 p.c. from the base level production of 1960-61.

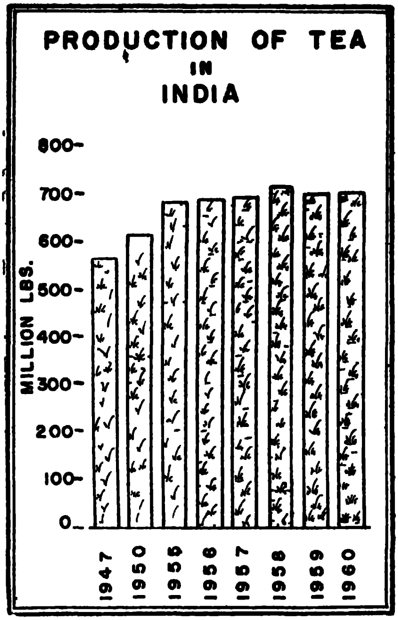


FIG. 21.

Various measures are being taken in the country to increase the production of tea. Many tea gardens cannot have the optimum production because of the lack of fertility in the soil and the high transport charges.

The Indian Tea Board has been subsidising the cost of fertilisers and transport charges as well as granting loans for the repairs and renovation of plants. There has also been reduction in the export duty of tea after 1958.

Recently, there has been much improvement both in quality and quantity of tea per acre of land. The average yield per acre is 880 lbs. The higher yield is the result of the use of fertilisers and the timely pruning of plants. It is interesting to note that though Madras is not a large producer of tea, it has the highest yield per acre.

GEOGRAPHICAL DISTRIBUTION OF TEA: AREA AND PRODUCTION

(1959)

State	Area (000 acres)	Production (000 lbs.)
Assam	384	366,114
Madras	73	54,416
Uttar Pradesh	6	7,000
Kerala	97	67,732
Punjab	10	2,000
West Bengal	194	166,963
Total	782	667,727

The annual production of tea has remained steady since 1955. In 1960 the production was 695 million lbs. as against 676 million lbs. in 1955.

TEA: YIELD PER ACRE (lbs.)

		1955	1959
Assam	...	1,012	953
Punjab	...	223	267
Mysore	...	561	568
Madras	...	686	1,014

Assam is the largest producer and contributes more than 50 per cent of the total Indian tea production. In the districts of Darrang, Sibsagar, Lakhimpur (in the Upper Brahmaputra valley) and in Cachar tea-plantations cover more than 30 per cent of the sown area. The Sadia Frontier Tract also grows a large amount. These areas are served magnificently by railway and rivers.

Although West Bengal occupies the second position in the list of tea-producing provinces, her tea-cultivation is not so extensive as that of Assam. The two adjoining districts of Darjeeling and Jalpaiguri produce almost the entire output of West Bengal. West Bengal's production varies between 20 and 25 per cent of the Union's total. Tripura raises a small quantity. Tea is also grown in Purnea, Ranchi and Hazaribagh in Bihar; Garhwal and Almora in the U.P., and Kangra in Punjab.* In Southern India, the major portion of the output is raised by Kerala and Madras; the other areas are Maharashtra and Mysore. The tea-producing districts in Kerala are Central Travancore, Kanan Devans and Wynad. In Madras State, the areas are Anamalais, Nilgiris and Nilgiris-Wynad.

The tea plantation industry provides direct employment to more than a million persons in the country.

It may be mentioned in this connection that tea-cultivation has opened up many areas which were previously inaccessible

* Bihar, Uttar Pradesh and Punjab account for 5 per cent of the total area under tea.

jungles and forests. Moreover, tea as a crop does not compete with other cash crops for land. Also, "the replacement of forests and jungles by tea does not to any extent lead to soil erosion and other evils, which are often the result of extensive denudation of forests for purposes of cultivation."

India is the greatest tea-exporting country in the world, supplying as she does about 50 per cent of the world's trade in tea. Between 66 and 70 p.c. of the total production of tea in India is exported.

The major markets for Indian tea are U.K., U.S.A., Canada, Irish Republic, Egypt, Iran, Australia, Netherlands, Western Germany and Turkey. The U.K. accounts for more than two-thirds of India's tea exports every year and the prosperity of the tea industry depends to a very large extent on the demand for tea in the U.K. which is the largest consumer in the world. Of the total exports to U.K. from India, tea accounted for 46 p.c. in terms of value in 1961.*

In 1959, India exported 472 million lbs. of tea. The percentage share of tea to India's total exports has on an average been 18 p.c. In 1958 tea was the largest single item of export and it accounted for about 25 p.c. of India's total exports. Thus tea has a distinct place in the Indian economy as a substantial earner of foreign exchange.

TEA EXPORT: P.C. OF TOTAL TEA EXPORTS

(in terms of value)

Destinations	1958	1960	1961
U.K. ...	65·5	62·8	59·9
U.S.A. ...	4·7	4·3	5
Canada ..	3·8	3·8	3·1
Irish Republic ...	3·0	3·2	2·8
Egypt ...	3·9	3·8	3·1
U.S.S.R. ...	6·0	6·2	6·9
Turkey ...	1·7	1·0	2

* The value of total British imports from India in 1961 was £144·9 million, of which tea was for £62·4 million.

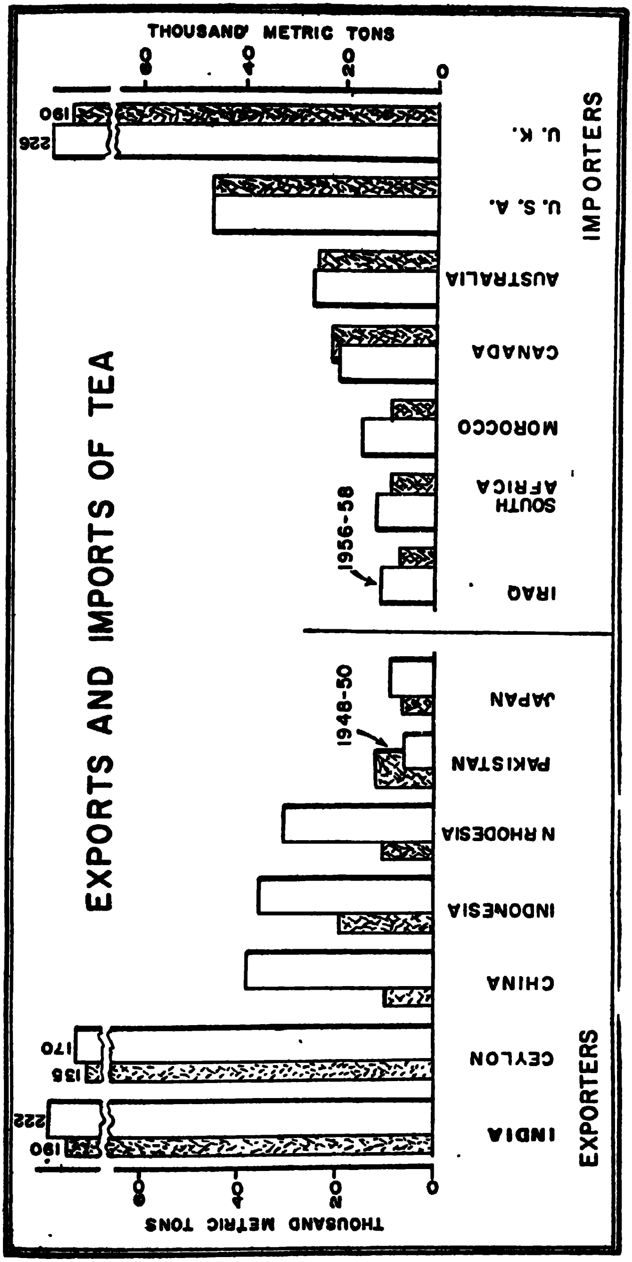


FIG. 22. Note the decline in the volume of exports in the case of Pakistan and the rise in the case of all other countries during the period 1956-58.

In 1961, India earned Rs. 124 crores from the export of tea of which U.K. contributed Rs. 75 crores, U.S.S.R. Rs. 9 crores, Egypt Rs. 8 crores, U.S.A. Rs. 6 crores and Canada Rs. 4 crores. Since Indian tea has to compete in foreign markets with that of Ceylon, Indonesia, Pakistan, Japan and East African countries, the exchange earnings are not very steady. In 1958 India earned Rs. 137 crores of foreign exchange by export of tea which came down to Rs. 120 crores in 1960.

Taking an average of the last few years, India supplies nearly 60% of the requirements of U.K., 90% of the Irish Republic, 35% of U.S.A., 45% of Canada, and substantial quantities to Egypt, Australia and Iran.

The export quotas of tea are now regulated by the Licensing Committee of the Tea Board under the Tea Act, 1953.* Normally, the Government authorises the Tea Board to allow export quota up to 65 per cent of the crop.

The table given below shows how fast the internal demand for tea is increasing. At the same time, the volume of export has considerably decreased. In order to meet the increasing demand for tea within the country and to promote exports of tea further, there is urgent need for raising the production of tea. The Third Plan has, therefore, given high priority to tea-plantation and envisages additional production each year by 175 million lbs. so as to have an estimated production of 900 million lbs. in 1965-66.

PATTERN OF DISPOSAL OF TEA

(Unit of quantity: In million Kgs.)

	1958	1959	1960
Production ...	360	360	312
Internal Consumption ...	106	124	162
Export ...	254	236	150
P.c. of Export to Production ...	70·6	65·6	51·3

* In view of the importance of tea industry in the economy of the country, the Government had taken interest in its development from its early stage. In 1903, the Tea Cess Committee was set up with the primary object of carrying on propaganda in favour of tea. The Tea Market Expansion Board was constituted in 1937 to the Tea Cess Committee. In 1947, the Central Tea Board was set up in 1953 "with powers to promote any measures calculated to make for the development of the tea industry and the tea trade."

The future of the tea industry is closely linked with the cost of production. India has to produce good quality tea at reasonable cost in order to face successfully the growing competition in the international market and also to develop the internal market. The methods of production must be improved, and so also the productivity of labour is to be increased. India has also to intensify her propaganda efforts in the export markets of Europe and North America. With a direct steamer service between Calcutta and Persian Gulf ports, Indian tea can have the Middle East markets as well.

Coffee

Coffee. The systematic cultivation of coffee in India was started from 1830 when a large plantation was opened in Mysore. Southern India has the monopoly of coffee cultivation in India.

The coffee plant requires a rich well-drained soil, a warm climate and a moderate supply of moisture. An annual rainfall of between 60 and 100 inches is usually considered the most suitable. The optimum temperature is between 59° and 77°F. Shade is required to protect the plants from too direct light and heat. Shade improves the growth conditions and prolongs the vitality of the plant. The unique quality of Indian coffee is due to the fact that the plants are grown under a protective canopy of natural shade trees. Such trees also prevent soil erosion and conserve moisture. Three to five years are required for the plant to mature after which it bears fruit for some thirty years. The plantations are generally located between levels 2,000 and 4,000 feet on hilly forest land. These areas are exposed to the summer monsoon. The optimum altitude and rainfall vary between districts: in North Mysore the best yields are obtained from estates at an altitude of about 4,000 feet with an annual rainfall of 50 inches, in North Coorg at 3,500 feet with a rainfall of 80 inches.

In India the plant is sown in the rainy season and the berries begin to ripen in October. Plucking and hand-picking of berries continue till January.

Nearly 2,80,000 acres of land are under coffee plantation and the average yield is 48,000 tons. There are two varieties of

coffee—*Arabic* and *Robusta*—of which the former accounts for 75 p.c. of the coffee production in India. Arabica coffee is noted for its good quality; Robusta has better resistance to pests and diseases, yields more and is cheaper to produce.

From 1947 onward, there has been a steady increase in the annual output of coffee in India. Unlike tea, the importance of coffee is more for internal market than export. There are about 12,800 coffee estates in India. Approximately 230,000 workers are employed. Though the number is small, from the point of view of South India's economy, it is highly significant in as much as two third of the workers are full-time and have no other source of income.

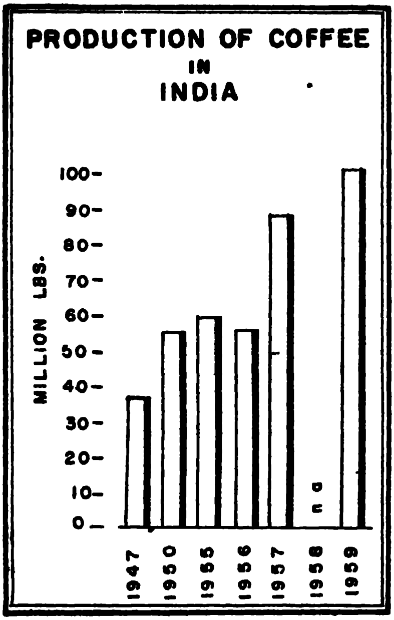


FIG. 23. Production of Coffee in India

The production of coffee has increased from 48 million lbs. in 1953 to 107 million lbs. in 1960, which has been possible because of the increase in the yield per acre.

GEOGRAPHICAL DISTRIBUTION OF COFFEE:
AREA AND PRODUCTION (ESTIMATES 1959)

State	Area (000 acres)	Production (000 lbs.)
Kerala	27	6,958
Madras	46	5,913
Mysore	167	55,271
Total	240	68,143

In 1960-61, the production was 128 million lbs.

Southern India has nearly 7,000 coffee plantations which engage 65,000 permanent labourers and 35,000 temporary labourers. Mysore alone possesses 4,600 plantations. In Mysore, the plantations are mostly confined to the south and west, particularly in the districts of Kadur, Shimoga, Hasan and Mysore. Mysore has the largest acreage under coffee plantation and the production is always over 80 per cent of India's total. In Madras coffee.plantations are found mostly in the south-west from North Arcot to Tinnevelley including the western areas. The Nilgiris is the most productive area of Madras. In Coorg more than 20 per cent of the total acreage is under coffee and the region supplies more than 1 per cent. A little coffee is also grown in the Satara district of Maharashtra. There are vast underdeveloped areas in the States of Madras and Mysore for the expansion of the coffee industry. Attempts are being made to grow coffee in new areas like Araku valley in Andhra Pradesh, in parts of West Bengal, Assam and Andamans.

The average yield of coffee per acre is 336 lbs, the highest being in Mysore with 395 lbs, and lowest 154 lbs. in Madras.

The importance of the industry lies in the fact that it provides employment for more than 220,000 persons in the plantations besides the thousands who are in industries and trades subsidiary to coffee production. About 25 crores of rupees have been invested in the coffee plantations. The Third Plan envisages an annual production of 80,000 tons as against the production of 48,000 tons in 1960-61, and more than two-fold increase in exports of coffee from the present level of 18,000 tons.

More than 80 per cent of the annual production of coffee is consumed in India. Coffee has already become a popular drink even in areas where till recently tea had its monopoly. Also, great efforts are being made to promote exports of Indian coffee. Indian coffee is exported to the U.K., France, Germany, Netherlands, Belgium, Australia and Iraq. U.K. is the largest buyer of Indian coffee and takes about one-third of the total coffee exported. Participating ports in the export trade are Mangalore, Tellicherry, Calicut and Madras (Mangalore 76 p.c., Tellicherry 11 p.c., Calicut 10 p.c., Madras 3 p.c.). The exports of Indian coffee are often affected by the competition of Brazilian coffee which to-day dominates the coffee market of the world. In

1959-60 and 1960-61, India earned as foreign exchange by exports of coffee Rs. 6·3 crores and 7·2 crores respectively.

PATTERN OF DISPOSAL OF COFFEE
(in 000 tons)

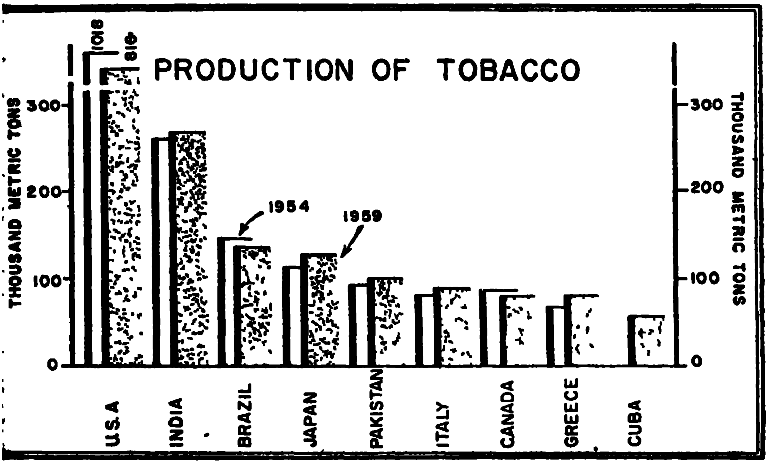
	Production	Export	Internal consumption
1952-53 ...	... 23	3	20
1955-56 ..	.. 34	10	20
1956-57 ...	... 42	15	27
1958-59 ...	... 46	18	28
1960-61 ...	... 48	18	30

The internal consumption which used to be of the order of about 20,000 tons a year a few years ago, has now gone up to over 30,000 tons a year. Export of coffee has also increased from what it was in 1956. The main problem before the coffee industry is to maintain the growing internal market as well as promote exports. The Indian Coffee Board which was constituted under the provisions of the Coffee Market Expansion Act, 1947, controls the marketing and export of coffee. All coffee grown in the country is required to be delivered into a pool maintained by the Coffee Board. Coffee is released for the internal market through public auctions and co-operative societies and exports are allowed only under Licences issued by the Board. The Board is also responsible for propaganda and publicity, agricultural and technological research and assistance to coffee estates for development. Propaganda in the U.K. and other parts of Europe is met by the levy of a customs duty at the rate of a rupee per cwt. on coffee exports and an excise duty at the same rate levied on coffee released for consumption in India.

Tobacco

The *Tobacco* plant was first introduced into India by the Portuguese in 1508. Subsequently, its cultivation spread gradually to various parts of the country. It has a wide climatic range and is cultivated in India throughout the country. The harvesting period is between February and April.

India is the second largest tobacco-producing country in world and contributes about 35 per cent of the world's total. lia, together with the U.S.A., and China, accounts for per cent of the world's tobacco-growing areas, which are of order of 7·2 million acres. In 1960-61 the area under tobacco India was 1 million acres and production about 300,000 tons. e third Plan aims to increase the output to 325,000 tons year.



. 24. Production of Tobacco in India *vis-a-vis* the World Production.

Tobacco cultivation is geographically confined to two main nes—the Eastern Zone, comprising Bihar, U.P. and West ngal and the Southern Zone, which comprises Madras, idhra, Mysore and Maharashtra.

GEOGRAPHICAL DISTRIBUTION OF TOBACCO:
AREA AND PRODUCTION (1960)

Areas	Area (000 acres)	Production (000 tons)
Andhra Pradesh	390	130
Maharashtra	246	64
Madras	200	27
Mysore	110	18
Eastern Zone	76	67
Total: India	1,022	306

There are two varieties of tobacco in India—*Nicotiana tabucum* and *Nicotiana rustica,* of which the former is important for export and the manufacture of cigarettes and cigars in India. *Nicotiana rustica* is in demand for hookah, chewing and snuff. Though 90 p.c. of our tobacco is *Nicotiana tabucum,* the top grade *virginia type* accounts for only 15 p.c. It may be mentioned in this connection that for export the Virginian type of Nicotiana Tabucum is in great demand.

The yield per acre varies greatly due to soil and climatic conditions of the producing regions.

YIELD PER ACRE IN LBS. (1958-59 to 1960-61)

Southern Zone		*Eastern Zone*	
Madras	1,206	Bihar	666
Andhra	692	U.P.	698
Mysore	499		
Maharashtra	554	All-India	645

The Eastern Zone has under tobacco about 100,000 acres and the production is about 30 p.c. of India's total. The districts of Muzaffarpur, Darbhanga, Monghyr and Purnea produce 90 per cent of Bihar tobacco. In West Bengal, tobacco tracts include Jalpaiguri and Cooch Behar; some quantities are also raised in Hooghly. West Bengal raises only cigar tobacco and hookah tobacco.

About 35 per cent of the production of raw tobacco in the country comes from Andhra where the important tobacco-growing districts are Guntur, Vizagapatnam, East Godavari and Bidar. Two-thirds of the total acreage of Andhra are confined to Guntur. Andhra is noted for cigarette virginia, cigar tobacco, cheroot tobacco, chewing tobacco and snuff.

In Gujarat, the tobacco growing regions are Baroda and Kaira. The principal varieties grown in Dindigul, Madurai, Tiruchirapalli and Coimbatore in Madras State are used for cheroots and cigars.

Outside these two zones, tobacco is cultivated in Punjab, particularly in the districts of Jullundhur, Hosiarpur and Gurdaspur.

The leaf produced in India is generally of course, heavy type, with a dark colour and a strong flavour and, as such, it is unsuitable for cigarette-making. Indian leaf makes an excellent filler. The loose cotton soil combined with the moist climate of Guntur, Krishna, East and West Godavari districts produces the best type of Virginia tobacco. These districts alone yield 95 per cent of India's cigarette tobacco. Guntur is the chief market.

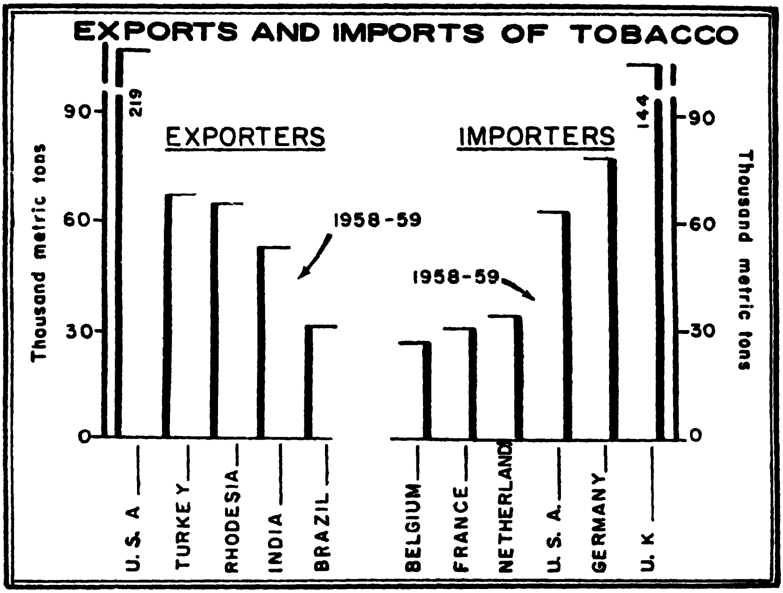


FIG. 25. Though India is the second largest tobacco producing country, her share in the world export trade is small.

Though India is the second largest tobacco-producing country in the world, her share in the world's export trade of tobacco is hardly 10 per cent. Of the average production, about 16 to 18 per cent is exported. Virginia tobacco produced in Andhra State forms the bulk of tobacco exports from India. The Tobacco Export Promotion Council has been set up (1956) in order to promote, sustain and explore new markets for Indian tobacco. The important markets are U.K., China, Japan, Aden, U.S.S.R., Ceylon, Egypt, Hong Kong, Indonesia and Netherlands. In the U.K. and other continental countries, the Indian flue-

cured Virginia tobacco has a demand in the cigarette manufacturing industry. As the exports are confined to high grade tobacco, the Third Plan aims at increasing the output of superior grade from 15 p.c. to 25 p.c. During the second Plan the quality was improved but not the volume of superior grade tobacco.

EXPORTS OF TOBACCO

	Quantity (in lakh kg)	Value (in lakh Rupees)
1959-60	410	14,54
1960-61 . . .	474	15,74

About ninety per cent of the exports are handled by Madras, the share of Bombay being 6 p.c. and of Calcutta, hardly 3 p.c. The U.K. has always been the chief market for Indian tobacco. One of the steps taken by Government to maintain the upward trend of Indian tobacco exports is to include tobacco in bilateral trade agreements.

The Government of India has constituted the Indian Central Tobacco Committee to assist in the improvement and development of production and marketing of tobacco. The Committee has established a Central Institute of Rajahmundry (Andhra) for research on cigarette, and regional experimental stations in Madras, Bihar and West Bengal. There is a great future for the tobacco industry in India as the annual consumption of cigarettes is estimated at several millions. If proper attempts are made, India can create markets in the Middle East, West Germany and U.S.S.R. for her tobacco.

India imports unmanufactured tobacco from Egypt, Turkey and U.S.A. in small quantities. In 1960-61, the volume of imported unmanufactured tobacco was 2 lakh kg, valued at Rs. 23 lakhs.

Sugar-cane

Sugar-cane. Sugar-cane and its products have been known in India from very ancient times. The earliest record of sugar-

cane in the history of the world occurs in *Atharva Veda* which was composed by the Aryans in India between 5000 and 1000 B.C. India has approximately 37 per cent of the world's sugar-cane area. Although sugar-cane is cultivated throughout India, the most important sugar-cane tracts are in U.P., Bihar, West Bengal, Punjab and Maharashtra. In fact, Northern India has a preponderant interest in the crop producing as it does about 70 p.c. of the total production. From the point of view of climate, Peninsular India is ideal for sugar-cane cultivation. The average yield of sugar-cane in the South is about four times as high as that in the north.

SUGAR-CANE: YIELD PER ACRE (1958-59 to 1960-61)

(in lbs.)

Southern States	
Andhra	6,280
Maharashtra	6,534
Madras	6,151
Mysore	5,571
Northern States	
Bihar	3,344
U.P.	2,541
Punjab	3,295
Orissa	3,835
All-India	3,330

There is an additional advantage in the fact that the crushing period of sugar-cane in the south is almost twice as long as that of upcountry plantation. But there are problems which stand in the way of greater expansion of sugar-cane cultivation in the Deccan. As the soils are not so rich like U.P., the sugar cultivation is confined to canal areas. The units of sugar-cane crops are small and scattered along the canals. Besides, as canal water is also required for the cultivation of food crops, extensive sugar-

would have gone down, had it not been for the development schemes under Plan periods. Sugar-cane cannot be cheaper unless the country produces more of it by increasing the *yield per acre* and not by increasing the area of cultivation. The low yield per acre in India is mainly due to small holdings of the cultivators. Where the farms are comparatively large as in the Deccan, the yield is considerably high. It should also be possible to increase the yield per acre with the introduction of better varieties. Even if an increase in the yield by 25 p.c. can be achieved, the availability of cane will be increased by 14 million tons. At the same time it must be remembered that mere increase in the average yield per acre will not help the sugar industry much unless at the same time the sucrose content in the cane is made higher.

Although sugar-cane is a quality product, its price in India is determined by the weight and not by quality and sugar content. The cultivators therefore feel encouraged to produce higher cane yields which actually result in lower sugar yields. The aim should be to produce cane of improved quality for increased output of sugar.

Recently, improved varieties of sugar-cane are being raised in different areas to replace the low-yielding indigenous varieties. It is also possible to introduce in India the methods of cultivation adopted in Java with suitable modifications to suit local conditions. Already a good amount of research work is being carried out in the various sugar-cane centres of India. The improvement of sugar-cane cultivation and the study of its pests and diseases are being carried on under the Indian Central Sugar-cane Committee.

Jute

Jute is the most important bast fibre of India and is an object of world commerce. "The demand for jute in the world's markets is based upon the fact that no cheaper fibre is procurable for bagging agricultural produce." The cultivation of the plant is restricted mainly to the Ganges-Brahmaputra delta in Bengal and Assam and in Bihar and Orissa, where the soil is enriched by alluvial deposits brought by river inundation favouring the growth of this exhausting crop without any expenditure on

manure. Jute is sown from March to May and it grows to a height of ten to twelve feet. The harvesting period begins in July and extends to September. In West Bengal, sowing is done in April and May, and harvesting time is mid-August to September. In Bihar and Assam, the time of sowing is March to April while in Orissa, it is May-June.

The progress of jute cultivation can be observed from the figures given below:

		Area ('000 acres)	Production of raw jute ('000 bales of 400 lbs. each)
1949-50	...	1,163	3,089
1955-56	...	1,581	4,137
1959-60	..	1,707	4,548

Jute requires for its successful cultivation a hot damp climate in which there is not much rain in the early part of the season. It grows best on a loamy soil or rich clay and sand, although the bulk of the total quantity of jute grown in Bengal is cultivated on *chars* and sand banks and islands formed by rivers. The necessary conditions for the successful cultivation of jute are: (*a*) high temperature with a minimum of about 80°F during the period of growth; (*b*) suitable soil; (*c*) sufficient rainfall; (*d*) distribution of rainfall over the period of growth; (*e*) an ample supply of water for soaking the plants and for washing the stripped fibre; (*f*) a suitable and efficient supply of labour to handle the crop at the proper time; and (*g*) facilities for placing the fibre on the market. The plants are grown in three different kinds of soil:—(*i*) rich sandy loams of high lands; (*ii*) *char*-lands, *i.e.*, alluvial soils which are situated in the neighbourhood of the river tracts and which are flooded during the rainy seasons; (*iii*) to low lying lands on the sides and in the deltas of the rivers.

The fibre from the stem is separated after the plant is retted in a pool of stagnant water for 20 to 25 days according to the nature of the water. Though the usual practice is to do the retting in tanks and roadside stagnant pools, in some districts the plant is submerged in rivers also.

With the partition of India in 1947, India was left only with about 600,000 acres of land under jute cultivation. The production was about 1·7 million bales of raw jute. Thus there

was an acute shortage of this raw material for the Indian Jute-mill Industry. The gap between production and the requirement had to be met partly by the jute substitutes such as *mesta* but mainly by jute imports from Pakistan. Measures were adopted by the Government of India for the extension of jute cultivation not only in West Bengal and Assam, but also in Bihar, Orissa, Kerala, Madras and Maharashtra. As a result of the vigorous efforts undertaken by the different States and the Central Government, India has about 1·8 million acres of land under jute cultivation and 707,000 acres under *mesta*. Production is about 5 million bales of raw jute and 1 million bales of *mesta*. From the point of view of acreage and production, West

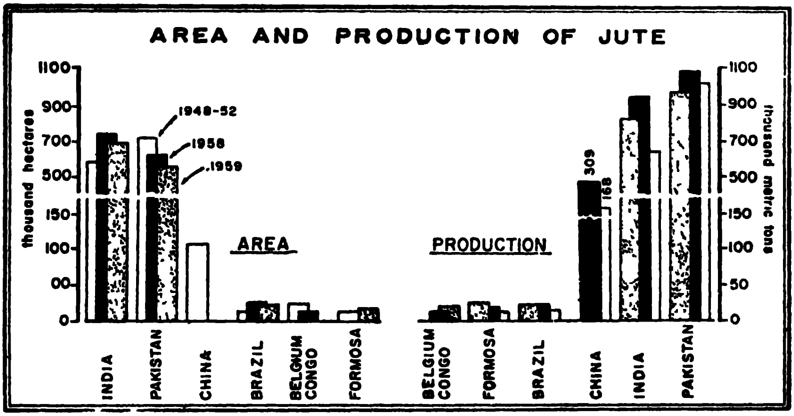


FIG. 26. Note the virtual monopoly of Production of Jute by India & Pakistan

Bengal occupies the first place, followed by Assam, Bihar, Orissa, Uttar Pradesh and Tripura. West Bengal raise about 50 per cent of India's total raw jute production. The production is on the increase in Bihar and Assam. The soil and climate of Assam are highly favourable for the cultivation of jute specially in the districts of Goalpara, Kamrup, Nowgong and Tezpur. The acreage in Assam can be further increased by at least 50% though the present problem is the scarcity of trained cultivators for jute production. U.P. has 33,000 acres of land under jute in the submontane tracts along the foot of the Himalayas which are fed by the rivers Sarju, Gogra and Cawka. These areas remain water-logged for about 5-6 months in a year and are therefore

very fertile for jute cultivation. Maharashtra State can contribute substantially towards jute production as it has indigenous jute in certain coastal districts whose quality is in no way inferior to that of Bengal jute. The problem is whether Maharashtra jute can be made available at prices equitable to the growers and reasonable to the manufacturers.

In Orissa both acreage and production have increased considerably during the last 4 or 5 years. The plant is cultivated extensively in the Cuttack district.

RAW JUTE PRODUCTION
(in thousand bales)

	1955-56	1960-61	Additional production in Third Plan	Estimated production at the end of Third Plan
Assam ...	1,212	813	400	1,213
Bihar ...	589	839	441	1,280
Orissa ...	245	261	400	661
U.P. ...	89	89	30	119
West Bengal	2,013	1,987	840	2,827
Tripura ...	50	41	40	81
Total ...	4,198	4,030	2,151	6,181

The yield of jute per acre varies from State to State. The average yield of jute per acre is 1047 lbs. with Assam at 1295 lbs., West Bengal 1042 lbs., Tripura 960 lbs., Bihar 871 lbs. and U.P. 1004 lbs.

The Agricultural Research Institute has introduced a new system of cultivation, as a result of which, not only has the *cost of cultivation been lowered, but the yield and quality improved considerably.* Jute is usually sown broadcast, and when the seedlings grow they are thinned out to ensure a rich crop. This system of cultivation involves wastage of seed and requires hand labour at the time of weeding. Under the new plan, jute is sown in lines, and not broadcast and the seeds are grown three to four inches apart in furrows drawn at intervals of one foot. In line-sown jute all subsequent operations, such as periodical weeding between the beds, are done by means of wheel hoes.

The normal requirements of raw jute by Indian mills are at about 67 lakh bales as against the present supply of 45 lakh

bales of raw jute and 10 lakh bales *mesta*. To meet the shortfall in production, the Third Plan has set a target of additional production of 2 million bales of raw jute each year between 1961 and 1966 so as to have an estimated production of 6·2 million tons in 1965-66, excluding *Mesta* which may provide an additional 1·3 million bales. A noteworthy feature is the occasional export of raw jute from India whenever there is a phenomenal rise in the production of jute and *mesta*, and consequent steepfall in prices. In 1959-60, India exported 37,000 tonne of raw jute.

Mesta: Because of the shortage of jute fibre after the partition, the development of *Mesta* fibre received great impetus in India. The crop is known in the different parts of India by different names such as *Ambadi* in Maharashtra, *Bimli* in Andhra, *Deccan hemp* in Hyderabad, *Pusa hemp* in Bihar and *Mesta* in Bengal.

Mesta can also thrive in areas which are not quite suitable for jute crop. Like jute, it grows to a height of 8 to 12 feet and is retted to separate the fibre.

Though *Mesta* is inferior to jute in respect of strength and fineness, it is being used with jute in India for the production of hessian and gunnies. In fact, this usefulness of *mesta* has made the position of the Indian jute mill industry almost independent of foreign sources of raw jute.

GEOGRAPHICAL DISTRIBUTION OF MESTA

	Area ('000 acres)		Production ('000 bales of 392 lbs. each)	
	1953	1959	1953	1959
Andhra Pradesh ...	237	124	394	261
Maharashtra ...	85	150	83	165
West Bengal ...	18	297	51	804
Bihar ...	26	54	26	105
All-India ...	484	738	682	1,474

The production and acreage of *Mesta* in West Bengal—the home of jute mill industry, has increased tremendously. Andhra's production is hardly three-fifths of that of West Bengal. The increased production of *mesta* in West Bengal is due to higher yield per acre.

YIELD PER ACRE (1957)

(in lbs.)

Andhra Pradesh	842
West Bengal	1,259
Bihar	778
Maharashtra	440

Mesta is also produced in Assam, Madhya Pradesh, Mysore, Orissa and Madras.

Cotton

Cotton: India is the second largest cotton-producing country in the world in respect of acreage, being preceded by the United States of America only. In spite of the fact that she occupies the second position, her share in the world-production is less than 10 per cent. Cotton holds the first place among the commercial crops of India. From the national point of view, cotton as raw material for the Indian textile industry, provides factory employment for about 700,000 persons, contributes annually to the Government a substantial revenue from export duty and excise duty and earns valuable foreign exchange from its export. The acreage under cotton has gone up from 15·7 million acres in 1952 to about 20 million acres in 1960-61. Production, too, during this period has increased from 3 million bales to 5 million bales. Climatic conditions at the time of sowing influence the actual output in a year.

GEOGRAPHICAL DISTRIBUTION OF COTTON: AREA AND PRODUCTION

State	Production Area ('000 acres)	Production ('000 bales of 392 lbs. each) 1958-59	Production ('000 bales of 392 lb. each) 1960-61
Gujarat ...	—	—	1,105
Maharashtra ...	10,833	2,176	1,207
Madhya Pradesh ...	2,185	653	567
Madras ...	1,204	358	420
Mysore ...	2,403	358	500
Punjab ...	1,415	800	900
Total ...	19,843	4,723	5,098

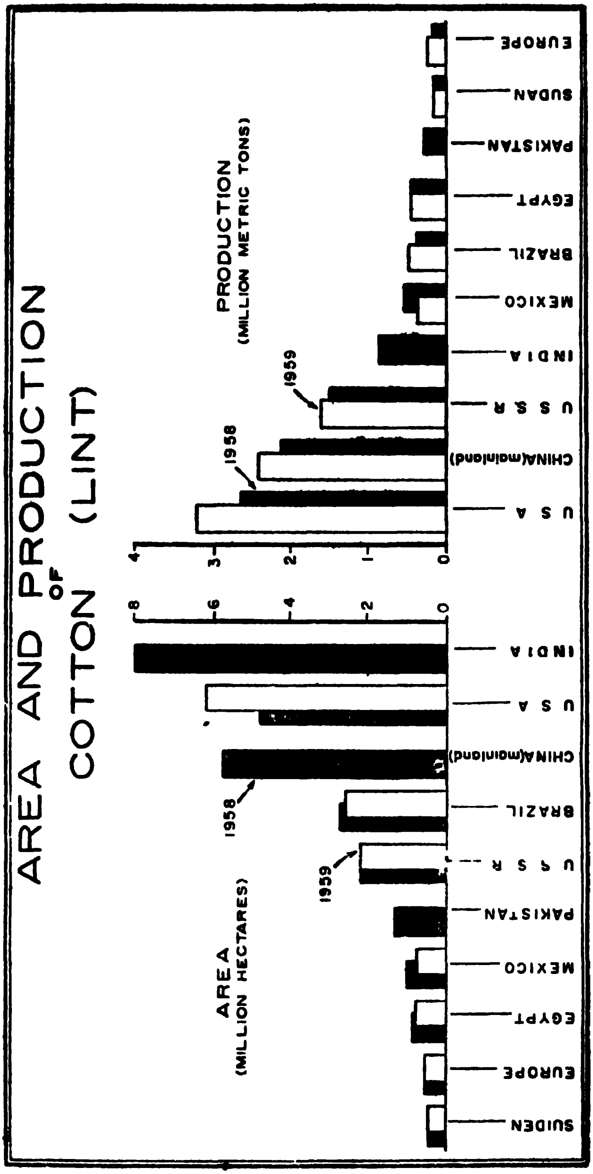


FIG. 27 Note the position of India in the total world production of Cotton.

India grows a large variety of cotton over a wide range of climatic, soil and seasonal conditions, from the sub-montane tract in the extreme north of the Punjab to the Tinnevelly district of Madras in the extreme south of India. Generally speaking it is a dry-region crop and flourishes where the rainfall is less than 40 inches. The soil is equally important. The sticky black soil of the Deccan is ideal for cotton cultivation. Cotton is cultivated in Maharashtra and Gujarat, western part of Andhra, Madras, Madhya Pradesh and parts of Rajasthan.

In India, cotton is considered long-staple when the fibre is 7/8" and above. When the fibre is below 7/8 inch and above 11/16 inch, it is medium staple. The fibre which is 11/16 inch and below is short staple.*

For long, India was noted for the production of short staple cotton. Thirty years ago the short staple cotton accounted for 58 p.c. of the total production as against 13 p.c. of long staple and 29 p.c. of medium staple cotton. Since then, more and more areas were put under improved varieties of cotton. The production of long staple and medium staple cotton has considerably increased and that of short staple has remained constant.

AREA AND PRODUCTION BY STAPLE LENGTHS (1961)
(Thousand bales of 392 lbs each)
Production

		1951	1956	1961
Long Staple	...	684	1,610	2,441
Medium staple	...	1,453	1,692	2,212
Short staple	...	773	699	741

Short staple cotton is in demand in foreign countries for mixing with wool. Assam, Manipur and Tripura can grow short staple cotton.

The areas of long staple cotton are Maharashtra, Madras, Punjab, Madhya Pradesh and Western Andhra. Medium staple

* The commercial varieties of Indian cotton are known as Bengal, Americans, Oomras, Surti and Dholleras. About one-third of the Indian cotton belongs to Oomras variety. Sometime in 1906, India tried successfully with a type of cotton from Indo-China, known as Cambodia. This cotton is now grown in the south-west of Deccan where the red soil regions were irrigated.

cotton is largely grown, besides the areas where long staple is available, in Rajasthan, Mysore and Uttar Pradesh.

The average yield of cotton per acre in India in 1957 was 93 lbs. compared to 439 lbs. in Egypt, 416 lbs. in Peru, 350 lbs. in Mexico, 341 lbs. in U.S.A. and 185 lbs. in Pakistan. Thus it compares very unfavourably with those in other cotton producing countries of the world. The average yield per acre of cotton varies from State to State. Generally speaking, the yield per acre is higher in the irrigated areas than in rain-fed areas.

COTTON (LINT): YIELD PER ACRE 1958-59 to 1960-61

in lbs.

Punjab ...	217	Madhya Pradesh ...	71
Kerala ...	178	Madras ...	136
Tripura ...	157	Maharashtra	86
U. P. ...	123	Mysore ...	67
Rajasthan ...	121	India ...	94

With the exception of the Punjab, the yield per acre is nowhere higher than 178 lbs, the lowest being 58 lbs in Mysore. The Central Cotton Committee is engaged in improving cotton cultivation in India. The Committee raises a cess of two annas a bale on all cotton produced in India to meet its necessary expenses. The Third Plan aims at having 108 lbs as the average yield per acre.

Because of the progress of production of long and medium staple varieties, India is now less dependent on foreign cotton.

The imports are now mainly confined to long staple cotton that cannot be produced in the country. The principal sources of foreign cotton are U.S.A., Kenya, United Arab Republic, Tanganyika and Sudan. About 80 per cent come from U.S.A. and United Arab Republic in almost equal proportion. In 1960-61, India imported 237,000 tonne of raw cotton as against 112,000 in 1959. The export of raw cotton from India is regulated by a system of quotas in view of the country's supply and demand position. In 1960-61, India exported 33,000 tonne of cotton as against 49,000 in 1959. Japan has once again become the largest consumer of Indian cotton with a share of about 50 p.c. followed by U.K. with about 12 p.c.

Since India needs more long staple cotton and can increase the export of medium and short staple cotton, the need for increasing the cultivation and production of cotton in the country is indeed great. There is considerable scope for cotton cultivation in Rajasthan, Maharashtra and Madhya Pradesh. Irrigation facilities for cotton cultivation are available to the cotton growing areas of Punjab, Gujarat and Andhra as a result of the various irrigation projects which are under construction, such as Bhakra-Nangal dams in the Punjab, Kakrapara dam in Maharashtra and others. Suitable schemes for the multiplication and distribution of improved varieties of cotton have been taken up in the important cotton growing States. Special research work has been undertaken to examine whether the long staple cotton which India now imports from the U.S.A. and East Africa can be grown in India itself.

According to the Third Plan, India will grow 6·1 million tons of raw cotton every year from 1961-62 to 1965-66.

Oil-seeds

Oil-seeds. The trade in oil-seeds is very recent in India. Oil-seeds are in demand not only for salads and food, but for preparing medicines, perfumeries, varnishes, lubricants, candles, soap manufactures and other purposes. The principal oil-seeds found in India are linseed, groundnut, cotton-seed, rape-seed, castor, sesamum-seed, copra, mowra-seed and polly-seed.

India is one of the leading oil-seed producing countries of the world. With the exception of palm kernels, olives and soya beans, she raises all the principal oil-seeds for world trade.

A large quantity of seeds is exported annually and this export forms a big item in India's foreign trade, and it occupies the fifth place among the exports. It is felt that India does not yet make the best use of her oil-seeds resources, though attempts have been made to develop local oil-crushing industry.

During recent years, however, our exports have considerably declined in respect of oil-seeds. The increased demand for oil-seeds in the country for cooking and industrial uses such as Vanaspati, soap manufacture, varnishes and lubricants is mainly responsible for the decline in export. Secondly, Brazil, Argentina and the United States of America have increased their pro-

duction of oil-seeds and therefore compete with Indian products in the foreign market. Thirdly, Indian castor-seed has failed to compete with the Brazilian counterpart while exports of linseed have come down due to the inability of India to offer it at attractive prices *vis-a-vis* Canada and South American countries.

PRODUCTION OF OIL-SEEDS 1959-60

(in '000 tons)

Seeds	Indian production	Indian production as p.c. of World production
Groundnut	4,690	56
Sesamum	392	27
Castor	108	22
Rapeseed	1,025	16
Linseed	525	14

OIL-SEEDS PRODUCTION IN INDIA

(in 000 tons)

	1955-56	1959-60	1960-61
Andhra Pradesh	1188	1080	1079
Gujarat	1202	1588	1050
Uttar Pradesh	765	1089	1180
Madras	870	945	1050
Mysore	503	580	700
Total	5643	6352	7084

Oil-seeds occupy about 33 million acres of land, and the production exceeds 6·5 million tons annually. The average yield of oil-seeds per acre is 451 lbs. The production of oil-seeds per year during 1961-65 is likely to be 9·8 million tons, and the average yield per acre will be raised to 500 lbs.

It is necessary to stimulate further production of oil-seeds in the country in order to meet the increased demand for coal consumption as well as for earning foreign exchange by export. So far as export is concerned, the policy is to encourage export of vegetable oils and not seeds. In 1959-60, India exported 107

million kgs of vegetable oils compared to 29,000 tonne of seeds. About Rs. 16 crores were earned as foreign exchange in 1959-60 from the exports of oils (Rs. 14 crores) and seeds (Rs. 2 crores). Recently export policy with regard to oil-seeds, vegetable oils and oilcakes has been considerably liberalised on account of foreign exchange consideration. Since there is also the urgent need for exploiting all available lands for food crops, the increase in the production of oil-seeds will have to be made either in lands which are not usually suitable for food crops or in off seasons. Thus, in Maharashtra and Uttar Pradesh it is possible to grow the early variety of groundnuts before the *rabi* crops. In Madras groundnuts and til-seeds can be cultivated immediately after the paddy crops. In Mysore, an increase in the production of groundnuts is likely in the cotton belts. There are also great possibilities of extending groundnut cultivation in the Punjab.

At present, the demand for oil-seeds arises mostly for making oils and fats (edible oil). Efforts are made to use more and more non-edible seeds like mohwa, neem, karanga and castor for industrial purposes to relieve the demand on edible seeds for similar purposes. It may be possible to get oil out of sal-seeds in Orissa.

Linseed. India is the second largest linseed-producing country in the world. Although it is one of the oldest fibre plants of India, linseed is cultivated for its seeds only. The plant requires the same kind of land as wheat and is grown as soon as the monsoon is over. The harvesting begins in February.

Linseed is mainly a rain-fed crop. The average rainfall between 30 and 70 inches per annum is best suited for its cultivation. Linseed is cultivated for its seeds mainlv in Madhya Pradesh, Bihar, Orissa, Uttar Pradesh, Maharashtra and West Bengal. It is also cultivated in Andhra, south-west Rajasthan, and Punjab. Madhya Pradesh is the leading producer followed by U.P. These two states normally supply about 70 per cent of India's production. In 1960, India had 3·9 million acres of land under linseed cultivation, and the production was 425,000 tons.

The United Kingdom, France, Belgium, Italy and Holland are the buyers of Indian linseed and linseed oils. About

17 million kgs of linseed oil were exported in 1959-60, which gave Rs. 2·5 crores as foreign exchange earnings.

Bombay handles two-thirds of the total exports of linseed. Argentina is a formidable competitor of India in regard to linseed oils in the foreign markets.

GEOGRAPHICAL DISTRIBUTION OF LINSEED (1959)

	Area ('000 acres)	Production ('000 tons)	Yield per acre in lbs.
Madhya Pradesh ..	1,440	103	160
Uttar Pradesh ...	717	96	300
Rajasthan ...	373	44	264
Maharashtra ...	592	54	204
West Bengal ...	119	7	132
Bihar ..	219	20	205
All-India ...	3,758	349	208

Mustard and Rape-seed, the Indian name of which is *Sarson,* is grown with wheat. Its cultivation is restricted to the northern part of India, and the principal areas are the Uttar Pradesh, West Bengal, Punjab, Bihar and Orissa. Uttar Pradesh alone supplies more than 60 per cent of India's total. In 1960-61 India had 7 million acres under mustard-rape seed and produced 1 million tons. Rape-seed is exported to the United Kingdom, Italy, Belgium and France. The quantity exported is, however, very small.

Groundnut. India is the largest groundnut-producing country in the world followed by French West Africa, China, U.S.A. and Indonesia. Groundnut is essentially a tropical product and as such is grown extensively in Peninsular India. The crop is sown in May-August and is harvested in November-January. It is grown mostly in Andhra and Maharashtra which together supply about 60 per cent of India's total. The other producers are Madras and Mysore. Recently groundnuts have been introduced in Madhya Pradesh and Chotanagpur. India exported 375 million kgs of groundnut oil in 1960 and earned Rs. 5 crores of foreign exchange.

It will be observed that Maharashtra with the highest production has an yield per acre which is below average.

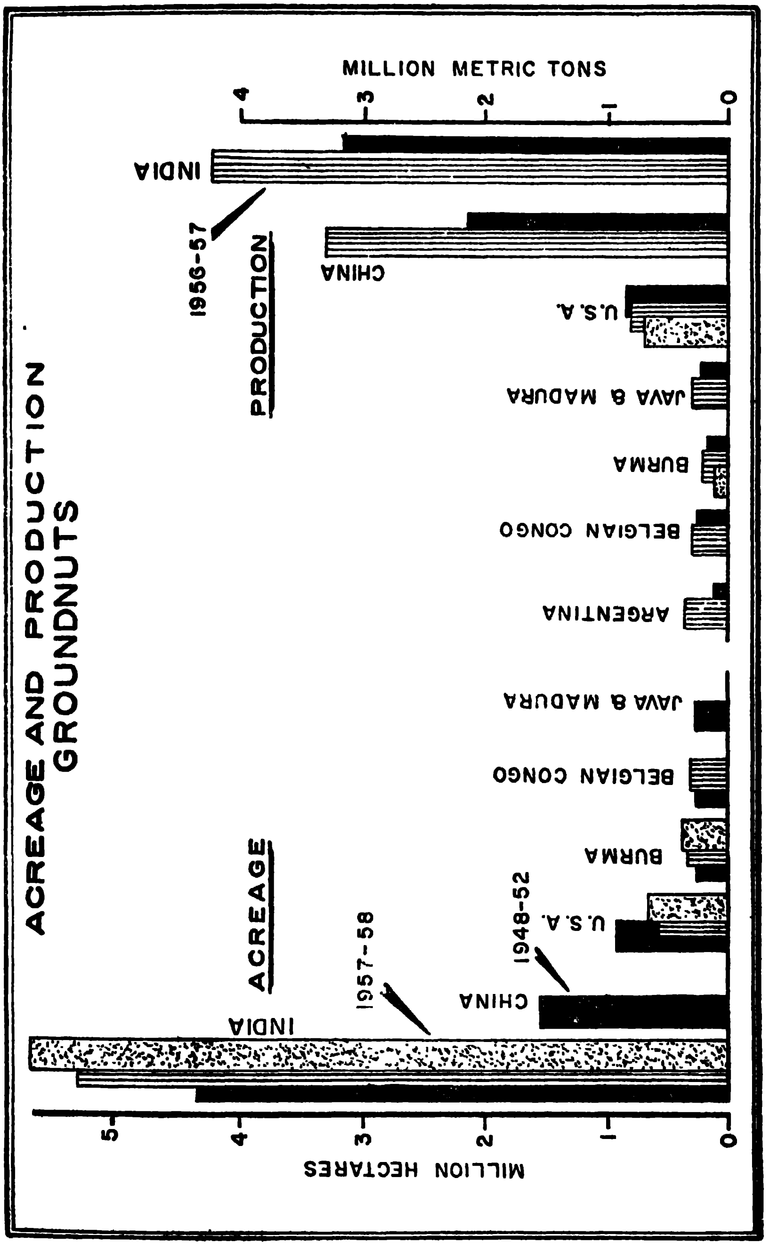


FIG. 28. Note the largest concentration of Acreage & Production of Groundnuts in India.

GEOGRAPHICAL DISTRIBUTION OF GROUNDNUT (1959-60)

	Area ('000 acres)	Production ('000 tons)	Yield per acre (in lbs.)
Maharashtra	...4,695	1,137	545
Andhra Pradesh	... 3,109	1,095	789
Mysore	... 2,070	557	603
Madras	... 1,801	855	1,063
U. P.	... 352	162	1,031
Madhya Pradesh	... 669	159	532
All-India	... 15,305	4,390	699

Sesame seed. The cultivation of sesame in India dates back earlier than the Christian era. India is the largest sesame-producing country in the world. Madhya Pradesh is the leading producer closely followed by Rajasthan. It is interesting to note that though Uttar Pradesh has the largest acreage under sesame cultivation, its production is lower than that of Madhya Pradesh and Rajasthan. The comparatively low yield per acre in Uttar Pradesh is due to its climatic conditions.

GEOGRAPHICAL DISTRIBUTION OF SESAMUM (1959-60)

	Area ('000 acres)	Production ('000 tons)	Yield per acre (in lbs.)
Uttar Pradesh	... 1,139	75	147
Rajasthan	... 1,102	81	165
Madhya Pradesh	... 929	92	222
Gujarat	... 605	44	163
Andhra Pradesh	... 675	56	186
All-India	... 5,510	392	186

The plant is grown on light and sandy soils, although some of the varieties in India do well on the black cotton lands. The highest yield per acre with 560 lb. is raised in Assam which has only 16,000 acres of land under sesamum cultivation. Small quantities of sesamum seeds are exported to the United Kingdom, France, Belgium, Italy and Egypt.

Castor seed. India holds a virtual monopoly in the production of castor seed, although small quantities are also cultivated in China, Indo-China, Brazil and Indonesia.

The castor plant requires warm climate. "A fair amount of moisture and rainfall after sowing is essential to ensure good germination; but after the root system has developed, less moisture is needed." It grows well on land where maize is cultivated. The plant reaches a height of 20 to 30 feet.

It is cultivated chiefly in Maharashtra, Gujarat and Andhra Pradesh. A little above 1 million acres of land is under castor plants in India with 120,000 tons of production. More than 50 p.c. of the production comes from Andhra Pradesh.

Export of castor oil is considerable. The principal buyers are the United Kingdom, France, the United States of America, Belgium, Italy, West Germany, and Canada. In 1960-61 India exported about 47 million kgs of castor oil and earned Rs. 6·7 crores as foreign exchange.

The U.K. takes about 50 per cent of the castor oil exported, followed by U.S.A. with about 20 per cent.

Coconut and Copra. Coconut is a very important source of vegetable oil. The tree is widely grown in islands and near the sea-sides of tropical lands. High temperature and heavy rainfall on alluvial lands are the ideal conditions for its growth. The tree takes 5 to 10 years to mature after which it continues bearing fruit for about 80 years. Each tree yields on an average 50 to 70 fruit per year. The chief products of the coconut are copra and coir fibre.

Copra is the commercial name for the kernel of the coconut, broken into small pieces and dried in the sun. The kernel of the coconut contains oil, which is an important article of commerce. This oil is edible and used for cooking purposes and for the manufacture of margarine and other butter substitutes.

India is the second largest coconut growing country in the world. There are 1·5 million acres of land under coconut cultivation in India. The production is about 450,000 tons of nuts a year. Kerala supplies more than 75 p.c. of the production. Andhra, Madras, Mysore, Maharashtra, Gujarat, Orissa and West Bengal are the other producers. In the south, three-fourths of the acreage under coconut are in the districts of Malabar and South Kanara and East Godavari. In Kerala State, the coconut tracts are found in the lowlands and the middle area. It also raises the tree in some quantities on a narrow strip of sandy tract on the western sea-board. The

biggest coconut areas of Mysore State are found in Tankur district followed by Hassan, Mysore, Chitaldrug and Kadur. In Orissa, the main concentration of coconut tracts is in the districts of Puri and Cuttack. The two districts of Ratnagiri and Kanara contain nine-tenths of the coconut acreage of Maharashtra.

The coconuts are important in India for a variety of purposes. Tender nuts are in demand for the milky fluid inside, which provides a refreshing drink. Mature nuts are used mainly for four purposes: (*i*) for making copra, (*ii*) for religious offerings, (*iii*) for edible purposes as fresh kernel, and (*iv*) for raising seedlings.

About 45 per cent of India's production of mature nuts is utilised for making copra, while an equal quantity is used also for edible purposes such as curries, chutneys, sweets, puddings etc.

Cotton seed. The importance of cotton seed as a source of oil was not fully appreciated till late in the 19th century. The oil is used in cooking, in pharmacy, in the preparation of lard and margarine, and as a substitute for olive oil.

Maharashtra, Punjab, Madhya Pradesh, Andhra and Madras are the chief producers.

Other seeds raised in India include poppy seed, mowra seed and niger seed.

Rubber

Rubber plantation was first introduced in India in 1902 on the banks of Periyar in North Travancore. The credit of initiating the cultivation of rubber in India belongs to the late Marquis of Salisbury, Secretary of State for India in 1900. The seeds secured in South America—*Amazon Para Rubber*—were sent here for the purpose of introducing the industry. The industry continued to develop till 1929 when the world-wide trade depression put a stop to further expansion. With the outbreak of the second World War and the fall of S. E. Asia in 1942, the rubber industry in India received a great impetus. Since then the industry is on its way to progress.

The demand for rubber is for articles like tyres, hoses, belts, pharmaceutical products, railway fitting, foam mattresses,

cushions and others. It is interesting to note that India and Brazil are the only two rubber manufacturing countries in the world which have their own rubber plantations.

RUBBER: ACREAGE

State and Union Territory		Area under production ('000 acres)	
		1945-50	1959-60
Kerala	... ...	149	178
Madras	... ...	7	2
Mysore	... ...	4	4
	All-India	162	261

The Indian Union produces about 26,000 tons of rubber annually. Of the Indian production, not more than 50 per cent is first grade rubber, the rest being lower grades. Rubber is mainly grown in the southern part of India. Madras, Mysore and Kerala are the principal producers of rubber. Both in respect of acreage and production, Kerala controls more than 96 per cent. The average yield per acre is about 400 lbs. of raw rubber with Kerala at 491 and Mysore at 230 lbs.

In Southern India, communications are well developed, and there is never any scarcity of labour in the plantations. The industry employs a labour force of over 150,000 persons in plantations, and produces about 24,000 tons of raw rubber a year. The manufacturing sector of the industry which is of recent growth in India has 30,000 workers.

PRODUCTION, IMPORT AND CONSUMPTION OF RUBBER

Year	Production (tons)	Import (tons)		Consumption (tons)
		Synthetic	Natural	
1954	21,493	3,371	17	25,506
1955	22,481	3,839	614	27,649
1956	23,763	9,677	3,534	34,797
1958	24,328	11,878	3,523	38,008
1961	26,400	13,000*	54,000*	50,000

The consumption of rubber has increased rapidly in recent years and is now estimated at 53,000 tons. Requirements by the end of Third Plan are estimated at 100,000 tons. To meet the increasing internal demand for rubber, the Government has a

* In terms of quintals.

plan to bring 1·2 lakhs acres of land under high yielding rubber. Even though efforts to produce more natural rubber becomes successful, there is urgent need for the production of synthetic rubber to meet the increasing demand for rubber. The inherent physical and chemical properties of synthetic rubber make it much superior to natural rubber in many applications. Besides, the new areas which will be brought under plantation will not give yield before 6 or 7 years. A synthetic rubber plant has been set up at Bareilly in U. P. In the course of the Third Plan, production of natural rubber will be increased to 45,000 tons.

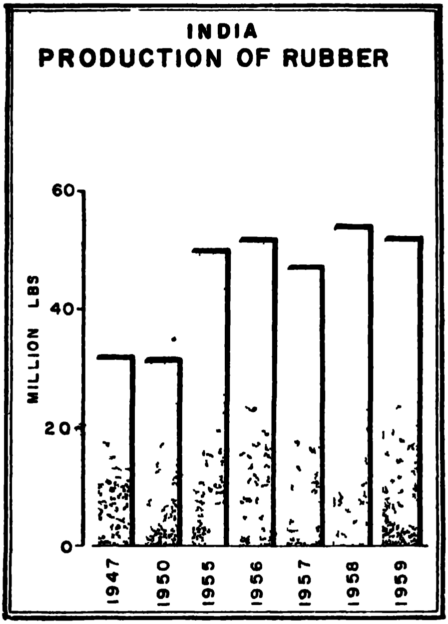


FIG. 29.

One of the problems of rubber plantation is the scarcity of suitable lands in view of the fact that its location is decided primarily by climatic and soil characteristics. Moreover, many areas which were, not long ago, used for rubber plantations, are now being cultivated for other crops

It is possible to increase the yield of rubber per acre from 400 lbs. to 1,000 lbs. India's geographical location and the fact that there are no other advanced manufacturing countries nearby, can make India a leading rubber goods exporter to Middle East, Africa and South-East Asian countries. However, the problem is to have a stable price of rubber so that adequate replanting and large scale new planting are made possible. A subsidy is given to all uneconomic areas to replant with high yielding plants.

QUESTIONS

1. What regions of India have specialized in the cultivation of the tea plant and why? Could it be grown profitably in other states?

2. What are the two principal plantation crops of India? Discuss which of these are important in India's foreign trade. Describe the conditions favourable for their growth and mention the regions of its production in the country. (Cal. B. Com. 1959 ; Rajasthan B. Com. 1960).

3. What are the geographical and climatic conditions necessary for the successful cultivation of jute and cocoanut? Where are they produced in India and how far is their supply sufficient for their requirements of export? (Indian Institute of Bankers, 1960).

4. Draw a sketch map of India indicating areas having a large raw cotton production and the more important places where cotton mills are located.

5. Name the five important oilseeds of India, describing the areas where they are produced and the uses to which they are put.

6. What are the causes of the low agricultural productivity in India? What suitable measures are being taken to improve the position?

7. Discuss the position of India with regard to food products. Explain why imported food continues to play an important role in meeting India's food deficit.

8. Describe the geographical conditions under which rice is cultivated in different parts of India. What are the measures adopted that have resulted in an improvement of its production in India? (Rajasthan B.Com. 1962).

CHAPTER VI

IRRIGATION WORKS AND MULTIPURPOSE PROJECTS

As India is essentially an agricultural country, the need for a sufficient supply of water is always great. The *Monsoon* is the main source of water to Indian agriculture ; but there are certain drawbacks in the character of the monsoon. These are:

(*i*) uncertain rainfall: In Rajasthan and many parts of Punjab rainfall is uncertain,

(*ii*) ill-distribution: About 30 per cent of the total area receives rainfall between 0-30" ; more than 75" rainfall is received by only about 10 per cent of the total area ; 60 per cent of the total area has rainfall between 30"-75",

(*iii*) absence of winter rain: Cultivation in winter requires artificial water-supply in the absence of winter rain ; and

(*iv*) certain crops require more water than rainfall can supply, *viz.*, sugar-cane and rice.

Because of its dependence on rainfall, which is uncertain, Indian agriculture is often described as "a gamble in the monsoon." Since eighty per cent of the annual rainfall in India is received in less than four months, the need for adequate water-supply for crops on a year-round basis is very urgent. Man is unable to control rainfall in which either deficiency, irregularity or super-abundance may give rise to disastrous famines. He can, however, provide measures which reduce famines. The chief among these is the extension of irrigation. Irrigation means supply of water to the fields by means of canals from rivers or from storage tanks for the purpose of agriculture. Of the available river water resources of the country, only about 28 per cent of the usable flow or 8 per cent of the total annual flow has been utilized till 1960-61. The Third Plan will bring the proportion to about 36 per cent of the usable flow. Ground water can be utilised for irrigating areas which cannot be irri-

gated economically by canals or which are susceptible to water-logging. "Generally speaking, the Indo-Gangetic basin, the Sabarmati basin and coastal areas in Madras and Andhra Pradesh offer favourable scope for ground water-development." Irrigation has been practised in India since time immemorial. Efficient and extensive irrigation works were constructed during the nineteenth century in the Ganga and the Jamuna in U.P., on the Sutlej in the Punjab, on the Godavari, Krishna and Cauvery in the Deccan, and on the Sone in Bihar.

Large-scale development of irrigation helps to rebuild the agricultural economy and to pave the way for the rapid industrialisation of the country. Irrigation is necessary in all parts of the country where the mean annual rainfall is less than 50 inches. This applies to Rajasthan where the rainfall is less than five inches in a year, to Uttar Pradesh, parts of Madhya Pradesh, Bihar, Punjab, Orissa and over the whole of the Deccan Plateau, except a range along the western coast. About 17 p.c. of the total area under cultivation in India is irrigated.

The area irrigated in Indian Union is about 70 million acres of which major and medium irrigation accounts for 31 million acres, and minor irrigation for 39 million acres.* This is the largest area which is irrigated in any country of the world. The irrigated areas in India are distributed as follows:

Himalayan region	4	million acres
Northern Plain regions ...	35	" "
Peninsular Hills and Plateau regions	15	" "
Western Ghats and Coastal regions	3	" "
Eastern Ghats and Coastal regions	13	" "

At the end of the Third Plan, 90 million acres of land in India will be brought under irrigation of which major and medium irrigation schemes will account for 43 million acres.

Irrigation in India is practised in four different ways: wild

* Irrigation projects in India have been classified as major, medium and minor on the basis of cost and expenses involved in their construction. Projects which cost more than Rs. 5 crores each are classed as major schemes and those costing between Rs. 5 crores and Rs. 10 lakhs as medium schemes. Any scheme which costs less than Rs. 10 lakhs is a minor scheme. For a balanced development of major, medium and minor irrigation schemes, it is essential that each area should be served by the kind of schemes for which it is best suited.

flooding, basin irrigation, furrow irrigation, border irrigation and irrigation by sprinklers. In areas where the supply of water is plentiful, water is made to flow in all directions. Such wild flooding causes soil erosion. In basin irrigation, level areas are enclosed by bunds to retain water to a desired depth as in rice cultivation. Border irrigation arranges for irrigating one field at a time with a thin film of water. In furrow irrigation, water is directed in furrows between rows of crops as in the case of maize. Where the rate of water seepage is high as on sandy soils, irrigation is done by sprinklers.

There are three main kinds of irrigation works in India. Well irrigation, Tank irrigation and Canal irrigation.

(i) WELLS: In areas where stream flow is seasonal and where storage from reservoirs is not feasible, wells are considered as a source of water-supply. About 17 million acres of area in India are irrigated by means of wells. The construction and maintenance of wells have been mainly the result of private enterprise. Water is raised from wells either by manual labour, bullocks, water-lifts, the Persian wheels or by means of oil engines. Well-irrigation is extensively used in Uttar Pradesh, Punjab, Madras, Maharashtra, Rajasthan and Madhya Pradesh. Irrigation through surface percolation wells is fairly common throughout the East. One of the disadvantages of irrigation by wells is that the water has no fertilising property in itself unlike the canal water which carries large quantities of fertilising silt to the fields irrigated. It is therefore necessary to use manure on soil irrigated by wells. The Government of India and the State Governments are now supplying manures, both organic and artificial, for securing maximum yield of crops from the fields irrigated by wells. In 1958-59, about 30,000 wells were constructed and repaired to irrigate 2 million acres of additional land. The *tube wells* are recent growths for purposes of irrigation. At present the U. P. and Bihar are the two States where tube-well irrigation has been introduced. The tube-well can be expanded greatly in Punjab, West Bengal, Madras, Andhra Pradesh and parts of Maharashtra, which have a relatively sure supply of ground water. Besides, these areas have potential for 2 or 3 crops per year. An average tube-well with a 6″ diameter tube can supply 33,000 gallons of water and irrigate about 400 acres of land.

For successful tube-well irrigation, (*a*) the area must be in alluvial formations where water-bearing strata at various depths are found; (*b*) cheap power for lifting water must be available; and (*c*) the soil should be of good quality so that high costs involved in the operation of tube-wells are compensated by larger produce.

(*ii*) TANKS: Tanks are really hollows, natural or artificial, in which rain water is collected and stored up. Tank irrigation is mainly prevalent in Madras, Orissa and Andhra. More than 11 million acres of land are irrigated by Tanks.

TANK IRRIGATION IN 1960

('000 acres)

Andhra Pradesh ...	2,916	West Bengal ...	963
Madras	2,195	Mysore	809
Orissa	1,233		
U. P.	1,040	All-India ...	11,099

Both wells and tanks require comparatively small outlays of capital, yield quick results and can be executed speedily with local resources. Tanks, however, fail to store water when there is failure of rainfall in the locality.

(*iii*) CANALS: This is the most important type of irrigation in India. Canals may draw their water either from rivers or from artificial storage. Canals are mostly constructed in Northern India, where the rivers have a flow of water throughout the year. Storage canals are mainly constructed in the Deccan. Here the rivers dry up during the hot season and, therefore, artificial storage is necessary. Rain water is stored across a valley by building a dam and then distributed to the neighbouring lands by means of canals. About 23 million acres are irrigated through canals. The total capacity of India's canals is over 220,000 cusecs, and the canals are over 60,000 miles in length.

River canals are of two classes: (*a*) Inundation canals and (*b*) Perennial canals. The inundation canals obtain water when the river rises above a certain level. Thus the canals depend for their supply of water on the natural flood level of the river. When the level is low, canals do not obtain water, but when the

river is in flood, they permit widespread cultivation. Irrigation is thus suspended from October to April when the level of the water is low. During this period cultivation is practised with the help of well-irrigation. To remedy this defect perennial canals are constructed.

The perennial canals draw their water from rivers which have their flow of water throughout the year. Some form of barrage is put across a river and its water is diverted by means of canals to the neighbouring areas. The great canal systems of the U.P. and Punjab are of this type. Many of the inundation canals are being transformed now into perennial canals. By perennial irrigation, agricultural production in the "uncertain zone of rainfall" has been enormously increased, for unlike the inundation method it affords its full advantage in the hot season and so permits cultivation all the year round.

The conditions are excellent for developing irrigation in Punjab. The state is flat, with soft alluvial soil. The development of canal irrigation has transformed large areas of semi-deserts into fertile agricultural lands. About 10 million acres of land are irrigated by canals and wells in the Punjab.

The important canal systems in Punjab are: (*a*) Western Jamuna Canal, (*b*) Upper Bari Doab Canal, (*c*) Sirhind Canal, (*d*) Eastern Canal and (*e*) Nangal barrage.

(*i*) The Western Jamuna Canal takes its water from the Jamuna river and irrigates the districts of Rohtak, Hissar, Patiala and Jhind. More than 1 million acres of land are irrigated by 1900 channels of the canal. The canal was opened in 1886. Under the Second and Third Plans, the canal is being remodelled to serve an additional area of 555,000 acres with irrigation.

(*ii*) Sirhind Canal takes its water from the Sutlej river at Ruper and irrigates the districts of Ludhiana, Ferozepur and Hissar, and Nabha. The canal was opened in 1886-87, and for many years thereafter suffered very seriously from the most aggravated form of silt trouble. Slowly, the headwaters were modified to overcome the difficulties. Today, this canal is one of the most stable canals in all India. About 1·4 million acres of land are irrigated by this canal system.

(*iii*) The Upper Bari Doab Canal takes its water from the Ravi river at Madhopur and irrigates the districts of Gurdaspur

and Amritsar. This canal is extended to Pakistan. In winter the supply of water in Ravi is not sufficient for the requirements of Upper Bari Doab Canal and for months together not a drop is allowed to pass below Madhopur. The canal was completed in 1879 and now serves about 1 million acre of land.

In Madras about 8 million acres of land are irrigated by tank-canals. The percentage of the area irrigated to the total area sown in Madras exceeds 40. The Periyar canal system is one of the best examples of irrigation that exist in Southern India. The flat land around Madura covering an area of 1,33,000 acres is watered by the Periyar river.* The Mettur irrigation system on the Cauvery river is the biggest in the Union and the "largest single block masonry reservoir in the world with a storage capacity of 93,500 million cubic feet". The Mettur dam was completed in 1934 and today 301,000 acres of land receive water for cultivation from the system. The other irrigation works in Madras are Perinchani, Lower Bhavani, Araniar reservoir, Sathanur and Pullambadi canal system.

U. P. has the largest irrigated areas in India. Of the total cultivated area of 51 million acres, the irrigated land accounts for about 16 million acres. The prosperity of the Uttar Pradesh is largely founded on the great irrigation works. Irrigated regions cover nearly 27 per cent of the area sown. Rainfall in the Upper Ganges valley is under 40 inches and irrigation is of vital importance. There are five large canal systems in the state.

(*i*) The Ganga Canal was completed in 1891 and has its headwater at Hardwar. It irrigates over 1·7 million acres of land and is the most important system of the state. The main canal is 213 miles long with branches and distributaries totalling 3,400 miles. It also supplies water to the Agra canal and the Lower Ganges canal.

(*ii*) The Agra Canal was opened in 1891 and is taken off from the Jamuna near Delhi. It irrigates over 447,000 acres of land.

(*iii*) The Lower Ganges Canal was completed in 1891. It is taken off at Narora in the district of Bulandshahr. The total

* The Periyar is a small river in the Western Ghats of Madras State whose water is drawn to the eastern part of the hills by means of a tunnel. The canal was opened in 1897.

length including channels exceeds 3,000 miles. It irrigates over 1 million acres of land.

(*iv*) The Sarda Canal is the largest productive canal of the Province. The Sarda is one of the tributaries of the Ganga. It rises from the Himalayas near Tanakpur on the Nepal border. The Sarda drains an area of about 6,000 miles in the hills. From its source to Tanakpur, the river is known as the *Kali*. Below Tanakpur, it is called the Sarda. After leaving Nainital district, it unites with the *Kaurida* to form the Ghagra. The construction of the canal was started in 1920 and completed in 1930. The headwaters are situated at Banbansa on the border of Nepal. It irrigates Rohilkhand and the western part of Oudh. The Sarda canal was further extended in 1955-56 to bring additional areas under irrigation. The Sarda system to-day commands an area of more than 2 million acres of land.

(*v*) The Eastern Jamuna Canal serves the north-eastern part of the state. The canal takes the water from the Jamuna near Faizabad.

The progress of irrigation in India has not been very rapid. Irrigated areas cover only 18 per cent of the total sown area in India. There is a great scope for irrigation in West Bengal, Bihar, Madhya Pradesh, Orissa, southern Uttar Pradesh and the whole of Peninsular India.

In West Bengal, only about 3 million acres are irrigated by canals out of the total cultivated area of 15 million acres. The two important irrigation works are Damodar Canal (1935) and Mayurakshi (1957). The new projects are the extension of the Mayurakshi, Damodar valley and Kangsabati. The need for irrigation facilities is urgent as at many places in the districts of Birbhum, Bankura, Burdwan and Midnapore, the rainfall is much below the quantity required for cultivation.

In spite of the presence of irrigation facilities, under-irrigation has become a major problem in many areas. It has been estimated that out of eight million acres of land which can use irrigation water because of the completion of a number of irrigation projects, only about 4 million acres of land have use of such facilities. The reasons for under-irrigation are: (*a*) inadequate field channels and (*b*) high water charges. Many cultivators cannot make full use of water from irrigation schemes because of the high water rates and levies. Since water charges

are levied on the basis of cost of irrigation schemes and not on the net benefit accruing to the cultivators, the under-irrigation will continue.

AREA SOWN AND IRRIGATED (1961-62)

(In thousand acres)

State		Gross area sown	Gross area irrigated	P.c. of gross area to irrigated area
Andhra	...	29,801	7,404	28·84
Assam	...	5,922	1,374	23
Bihar	...	25,336	4,197	16·56
Maharashtra and Gujarat	...	68,686	3,815	5·55
Kerala	...	5,218	1,054	20
Madhya Pradesh		41,547	2,091	5
Madras	...	16,777	6,771	40
Mysore	...	25,265	1,740	6·89
Orissa	...	15,079	2,151	14·26
Punjab	...	20,176	8,302	41
Rajasthan	...	28,069	3,353	12
U. P.	...	50,632	13,681	27
West Bengal	...	15,378	2,970	19
Jammu and Kashmir	...	1,818	684	38
Total States	...	3,49,704	59,587	17·04
All-India	...	3,67,000	63,000	18

Flood-control, drainage and anti-water logging are closely related to irrigation. There is urgent need for providing drainage in irrigated areas to prevent their deterioration by rising ground water table and consequent water logging conditions. Water logging in certain parts of the country, in particular the Punjab, has become a very serious problem. Anti-water logging measures such as drains, lining of irrigation channels in selected reaches and other steps to depress the ground water table have been taken on an extensive scale. Flood control schemes are also under way in many areas, where floods occur frequently and destroy crops during the monsoon. The

Brahmaputra in Assam, the north-west rivers of the Punjab and U.P., and the rivers of Madhya Pradesh, Andhra Pradesh, West Bengal, and Kerala are receiving attention for flood control. The Central Government has set up *Central Flood Control Board* to coordinate the work of various States in this regard. In the Third Plan period, Rs. 61 crores will be spent for flood control, drainage, anti-water logging and anti-sea-erosion scheme (as in Kerala).

Indus Waters Treaty

Mention may be made here of a treaty signed by India and Pakistan concerning the use of the waters of the Indus system over which there was a dispute for 13 years.

The Indus Waters Treaty allocates the waters of the three Eastern Rivers—Ravi, Beas and Sutlej—to India, with certain exceptions specified in the Treaty. The main exception is that during a transition period, while the works are being constructed in Pakistan for the replacement of Eastern River Water, India will continue to deliver water to Pakistan from the Eastern Rivers in accordance with a schedule set out in Annexure to the Treaty. The transition period will be ten years, but may, in certain circumstances, be extended by a further one, two or three years. The waters of the three Western Rivers—Indus, Jhelum and Chenab—are for the use of Pakistan, and India undertakes to let flow for unrestricted use by Pakistan all the waters of these three rivers, subject to Treaty provisions that some of these waters may be used by India in areas upstream of the Pakistan border for the development of irrigation, electric power and certain other uses spelled out in detail in Annexures to the Treaty. Pakistan undertakes to construct during the transition period, a system of works, part of which will replace from the Western Rivers, those irrigation uses in Pakistan which have hitherto been met from the Eastern Rivers.

The Indus settlement also envisages the construction of a large earth-filled dam on the Beas River in India. This dam will create a reservoir with a live capacity of 55 million acre feet, and a hydro-electric potential for generating 200,000 kilowatts of power. Together with the Bhakra Reservoir on the Sutlej River and with the newly constructed Rajasthan canal system,

it will serve as the basis for irrigating large areas in the Punjab and in the Rajasthan desert. The importance of the Indus Waters Settlement for India's economy is that it ensures water need for further extension of irrigation facilities to many areas in Rajasthan and the Punjab, including the Rajasthan canal which is one of the longest of its kind in the world.

THE MULTI-PURPOSE RIVER VALLEY PROJECTS

Although India leads the world in irrigation, there is urgent need for further extension of irrigation facilities to many areas to step up production of food which has of late fallen below requirements. It has been estimated that out of the total quantity of water available in the rivers of the country and the sub-soils only six per cent has so far been utilised for irrigation and the rest runs to waste and in its progress to the sea does incalculable damage to life and property through uncontrolled floods. On a rough calculation the mean annual supply of water in the rivers of India is of the order of 2·3 million cubic feet per second. The mean annual utilization of water for agricultural and other purposes through canals is roughly 133,000 cubic feet per second.

UTILIZATION OF WATER RESOURCES IN SOME IMPORTANT RIVER BASINS

(in million acres feet)

River system	Average flow	Utilization upto 1956	Additional utilization in 1960-61
Indus	168	20	1
Ganga	400	40	14
Brahmaputra ...	300	—	—
Godavari	84	13	1·5
Mahanadi	84	11	·2
Krishna	50	26	2·6
Narmada	32	0·2	10
Tapti	17	0·9	3·5
Cauvery	12	9	·6

Several projects have been undertaken by the Central and State Governments for power and irrigation in India. *The*

projects are being so designed as to provide not only for irrigation, but also for hydro-electric power, flood control, navigation, recreation facilities and fish culture. Hence these projects are also known as multi-purpose plans. After the completion of these plans, India will be using about 10 p.c. of her latent water-power capacity, and about 19 million acres of additional land will become available for cultivation. The completion of the schemes will also help the Government to tackle successfully the problems of refugee resettlement, of feeding the increasing population and of improving the general standard of living.

For the purpose of planned development, India can be divided into the following river basins:

(*i*) The river-system of Punjab.
(*ii*) The Central Ganga basin between its source and the eastern borders of Uttar Pradesh.
(*iii*) The Eastern Ganga basin drained mostly by its northern tributaries.
(*iv*) The Brahmaputra system of Northern Assam.
(*v*) The Hooghly basin which comprises parts of Eastern Bihar and almost the whole of Western Bengal.
(*vi*) The Orissa river system bounded on the north by the watershed of the Subarnarekha and on the south by Mahanadi.
(*vii*) The Godavari system with its tributaries draining into the Bay of Bengal.
(*viii*) The Krishna system which covers some of the dry districts of Andhra State. The Krishna Dam site is near the confluence of the Krishna and the Tungabhadra.
(*ix*) The Cauvery System.
(*x*) The Madhya Pradesh river system of the Tapti and Narmada.
(*xi*) The Malwa river system striking the Eastern borders of Rajasthan and centring round the Chambal which drains to the Jamuna.

For the development of some of these river-valleys, thirteen multi-purpose projects and thirty-nine major irrigation schemes are under construction:

The multi-purpose river valley projects are the following:

(*a*) The Damodar Valley Project (of the Hooghly basin).
(*b*) The Hirakud Project (of the Orissa river system).
(*c*) The Narmada Project (Gujarat).
(*d*) The Tungabhadra Project (Andhra Pradesh and Mysore).
(*e*) Ramganga Project (U.P.).
(*f*) Bhakra-Nangal Project (Punjab and Rajasthan).
(*g*) The Nagarjunsagar Project (Andhra Pradesh).
(*h*) Gandak (Bihar and Uttar Pradesh).
(*i*) Parambikulam Project (Madras).
(*j*) Bhadra (Mysore).
(*k*) Ukai Project (Gujarat).
(*l*) Tawa (Madhya Pradesh).
(*m*) Beas (Punjab and Rajasthan).

These projects will not only provide irrigation and generation of electric power for industrial purposes, but will also control floods and remove malaria, foster navigation, land reclamation, fish culture, etc.

Some major irrigation schemes, continuing from First and Second Plans to the Third Plan are as follows:

Name and State	Utilisation gross area (on completion) (in '000 acres)
Chambal (Rajasthan and Madhya Pradesh) ...	1400
Khadakvasla (Maharashtra)	43
Koshi (Bihar)	1397
Narmada (Gujarat)	963
Rajasthan Canal (Rajasthan)	1684
Sone Project (Bihar)	307

In addition, there are important State projects like Mor river (West Bengal) and Ramapadasagar (Madras). The Mor river project of Bengal will bring irrigation to 700,000 acres under kharif and 1 million acres under rabi. The dam will be 117 feet high to store 0·5 million acre feet of water. The Ramapadasagar project aims at irrigating 2·5 million acres of land in Andhra. It will develop 150,000 Kw. of firm power and provide, in addition, navigation facilities from the port of Vishakhapatnam to the hinterland of the lake.

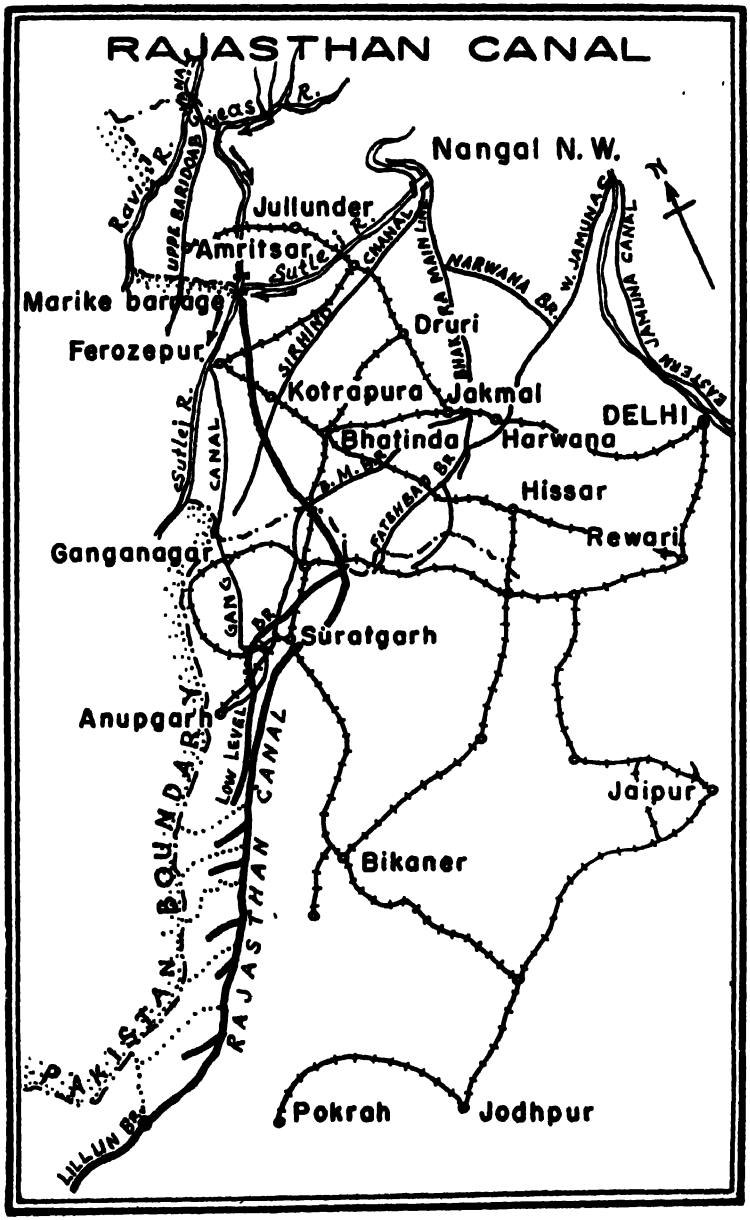

RAJASTHAN CANAL
Nangal N.W.
Jullunder
Amritsar
Marike barrage
Ferozepur
Ravi R.
UPPER BARIDOAB
Beas R.
Sutlej R.
SIRHIND CANAL
NARWANA BR.
W. JAMUNA C.
EASTERN JAMUNA CANAL
Druri
BHAKRA MAIN LINE
Kotrapura
Jakmal
DELHI
Bhatinda
Harwana
Hissar
Rewari
FATEHABAD BR.
B.M. BR.
Ganganagar
GANG CANAL
Suratgarh
Anupgarh
LOW LEVEL
RAJASTHAN CANAL
PAKISTAN BOUNDARY
Bikaner
Jaipur
Pokrah
Jodhpur
LILLUN BR.

FIG. 30.

DAMODAR VALLEY PROJECT

The Damodar (also known as the River of Sorrow) is 336 miles long. It has its source in the Hill of Chotanagpur at an elevation of 2,000 feet. After flowing for 180 miles in Bihar it enters West Bengal and ultimately joins the Hooghly. In its upper valley lie parts of Hazaribagh, Palamau, Ranchi, Manbhum and Santal Parganas in Bihar. Here the rainfall is about 47 inches annually, most of which fall during the monsoon. "Torrential rains crash down upon the deforested hills, and the unimpeded rain-water tumbles down the hills into the river. The unchecked flow erodes land in Chotanagpur and swells the volume of water in the river." The lower portion of the valley lies in West Bengal, where the flooded Damodar overflows its banks, destroys crops and dwellings, carries away men and cattle, disrupts communications and dislocates temporarily the economic life of the valley.

It was realised in 1943 that the river could be made to work for multi-purpose development and become a source of wealth and power to Bihar and West Bengal.

The Damodar Valley with its surrounding areas is the most highly developed industrial region in India. In it are situated India's two largest iron and steel plants, her largest fertilizer plant, the Government locomotive works and cement works.

The upper Damodar basin is very rich in timber, lac and tussore. The lower basin though very fertile is without proper system of irrigation for which intensive cultivation is not possible. The Damodar Valley contains the largest coal deposits of India and considerable quantities of bauxite and aluminium. The valley has also fire clay, china clay, mica, lime-stone, lead, silver, antimony and quartz. With cheap electric power, these minerals can be properly exploited.

The Government of India in 1948 set up by an Act a Corporation to implement the Damodar Valley Project. The Damodar Valley Corporation is in charge of execution and operation of schemes for irrigation, the generation of power and flood control. There will be provision for navigation, afforesstation, public health and industrial, economic and general well-being of the people of the Valley.

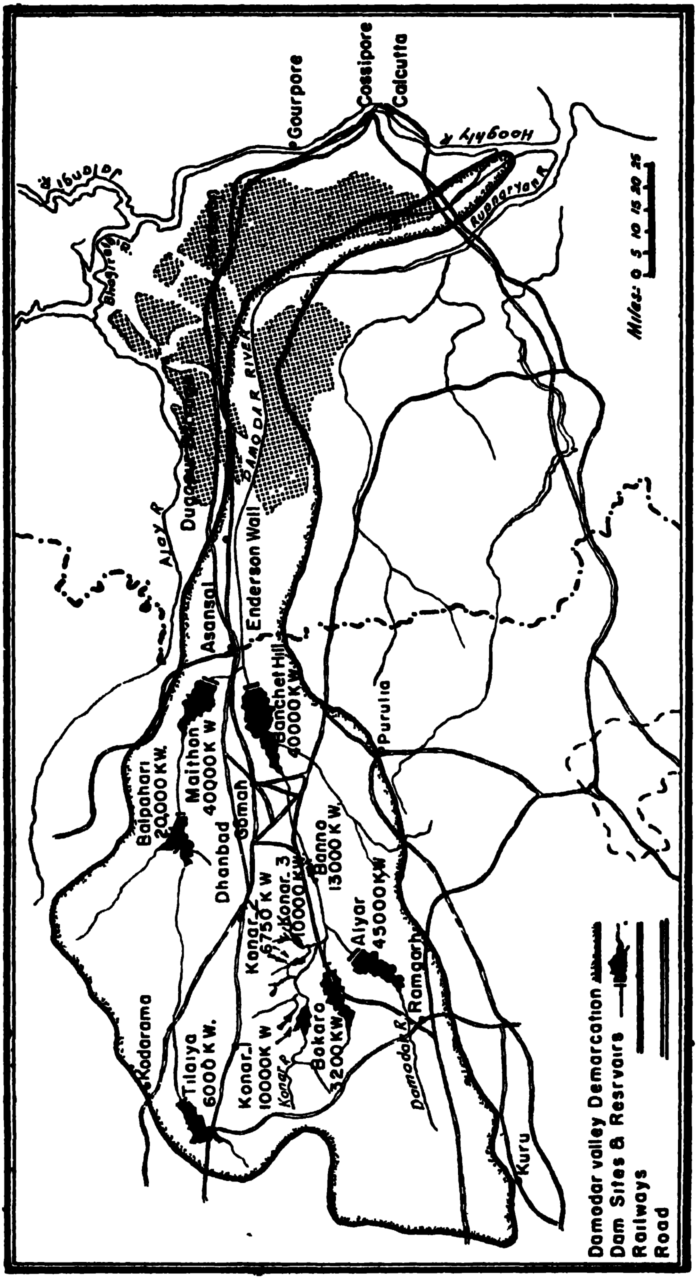


FIG. 31. The Project by taming the Damodar and its tributaries has controlled flood and Malaria, and has become an important supplier of Power.

The project envisaged the construction of four storage dams with hydro-electric installations at *Maithon on the Barakar, one across the Konar, Tilaiya on the Barakar and one near the Panchet Hill on the Damodar*; three thermal power stations at Bokaro, Durgapur and Chandrapura; an extensive power transmission grid and an irrigation barrage at Durgapur with canals and distributaries. The 2,271 feet long and 38 feet high barrage at Durgapur in West Bengal was completed in 1955. It will irrigate over 1 million acres of land through canals. There will also be a navigation-cum-irrigation canal 90 miles long which will be connected with the Hooghly 30 miles upstream from Calcutta. The canal will handle coal and other materials between the Damodar Valley and Calcutta. The canal will have a system of distributaries of 1550 miles in length. The thermal power station at Bokaro which was opened in 1953 utilises low grade coal for 200,000 Kw. power which evens out seasonal fluctuation of hydro-electric power. The four dams at Tilaiya, Konar, Maithon and Panchet Hill have an aggregate storage capacity of 2·89 million acre feet of water with an installed hydro-electric capacity of 146,000 Kw. Flood reserves are provided at Maithon and Panchet Hill to cut down floods from 650,000 cusecs to 250,000 cusecs. The Tilaiya Dam above the river Barakar was opened in 1953 and is 1200 feet long and 112 feet high. It will moderate flood level and supply water for irrigation to serve about 100,000 acres of land. It is estimated that the irrigation system will help to get an additional production of 400,000 tons of food grains. There will also be fish culture in the lake.

The Konar Dam on the Konar, a tributary of the Damodar, is 12,860 feet long and 196 feet high. The Dam was completed in 1954. About 100,000 acres of land are to be irrigated from the storage water. It will also give 19,10,00,000 Kw. hours per annum. The Maithon Dam has been constructed across the lower reaches of the Barakar. It will regulate floods, provide 16,40,00,000 Kw. hours per annum of hydro-electricity and supply water to 270,000 acres of land for cultivation. The Maithon dam is 11,773 feet long and 158 feet high. The central location of the Maithon dam makes it the chief centre for distributing power to Sindri, Chittaranjan and other workshop areas. The Panchet Hill Dam which has been recently completed, is

designed primarily to control flood. A hydro-electric station of 40,000 Kw. has been built near the dam.

Soil and water conservation in the Damodar valley is an integral part of the DVC Project. Without soil conservation the dam reservoirs silt up quickly; and if soil erosion is allowed to continue, more of the top soil will be washed away. Therefore extensive soil surveys have been made. A number of small irrigation-cum-soil conservation dams were constructed in the upper reaches of the valley in the earlier part of the DVC's career. The Adivasi dam, Deochanda dam, Bachhi dam and Gauria Karma dam hold back rain water, prevent gully erosion and supply water for irrigation.

Other activities of the Damodar Valley Corporation are to assist in the development of small scale and cottage industries by investigating into their possibilities and starting pilot schemes.

The Hirakud Dam Project is designed to supply water for irrigation and power for industrial development of Orissa. It

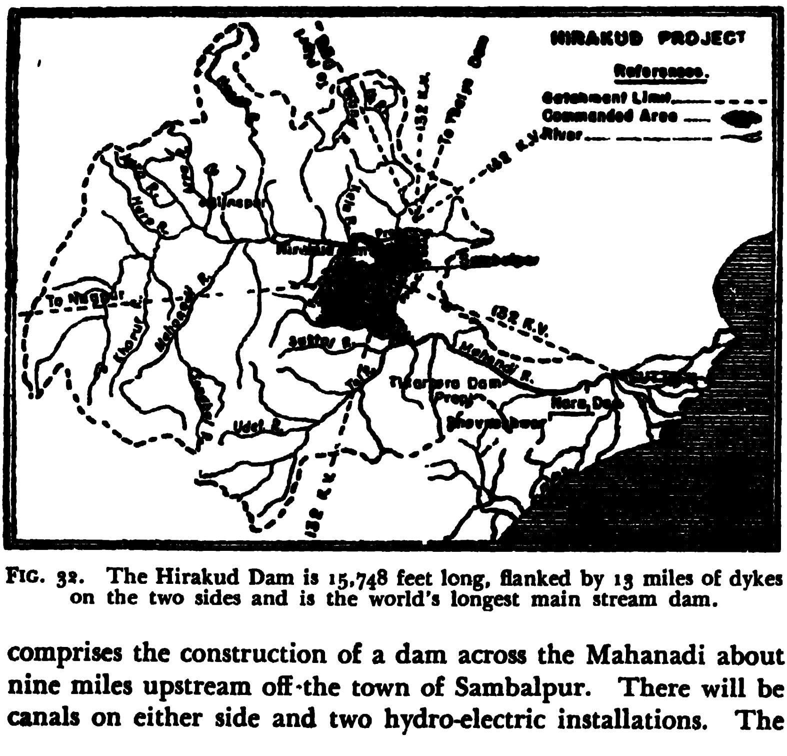


FIG. 32. The Hirakud Dam is 15,748 feet long, flanked by 13 miles of dykes on the two sides and is the world's longest main stream dam.

comprises the construction of a dam across the Mahanadi about nine miles upstream off the town of Sambalpur. There will be canals on either side and two hydro-electric installations. The

Hirakud dam is 150 feet above the river-bed with gross storage capacity of the reservoir of 5·3 million acre feet. Two other dams are being constructed on the Mahanadi—one at Tikarpara and the other at Naraj, a few miles west of Cuttack. The three projects, when completed, will provide irrigation to 2,500,000 acres of land, generate 3,50,000 Kw. and will also provide navigation facilities. The whole of the Mahanadi Valley particularly Sambalpur district, Sonepur and the delta region will be specially benefited by these schemes. The area served by the Hirakud is very rich in minerals like iron, bauxite, manganese, graphite, chromite, mica and other useful minerals, most of which are largely unexploited. The Hirakud will supply power for their development. The main dam and dykes have been completed in all reaches, and these provide irrigation facilities for 330,760 acres of land. Power is now being supplied to Hirakud for Indian Aluminium factory, Rajganjpur for the cement factory, Rourkela for steel plant, Joda for ferro-manganese plant, Brajarajnagar for paper mills and Chawdwar for textile industries. Hirakud is supplying power to Cuttack, Puri, Sambalpur and Sundergarh.

The Koshi Project is the most important scheme in Bihar. It will be a multi-purpose project for irrigation, power, navigation, flood control, silt control, soil conservation, drainage, reclamation of water-logged areas, malaria control, fish culture and recreation facilities. The project will comprise a dam about 750 feet high across the Chatra Gorge in Nepal to store about 11 million acre feet of water. There will be two barrages on the Kosi:—(*a*) The first one in Nepal will control and stabilise the river channel and will divert its supplies into two canals on either side. About a million acres of land in Nepal territory will be irrigated by these two canals. (*b*) The second barrage will be near the Nepal-Bihar border, where two canals on the left and one on the right will be constructed for irrigating over two million acres in the districts of Purnea, Darbhanga and Muzaffarpur in Bihar.

The power plant at the dam site will be capable of generating 1·8 million Kw. of cheap power.

The Tungabhadra Project comprises the construction of a dam 8,200 feet long and 160 feet high across the Tungabhadra, a major tributary of the Krishna. The reservoir will contain

2·6 million acre feet of water and will serve Mysore and Andhra. About 600,000 acres of land will be irrigated by the scheme. The dam was inaugurated in 1953.

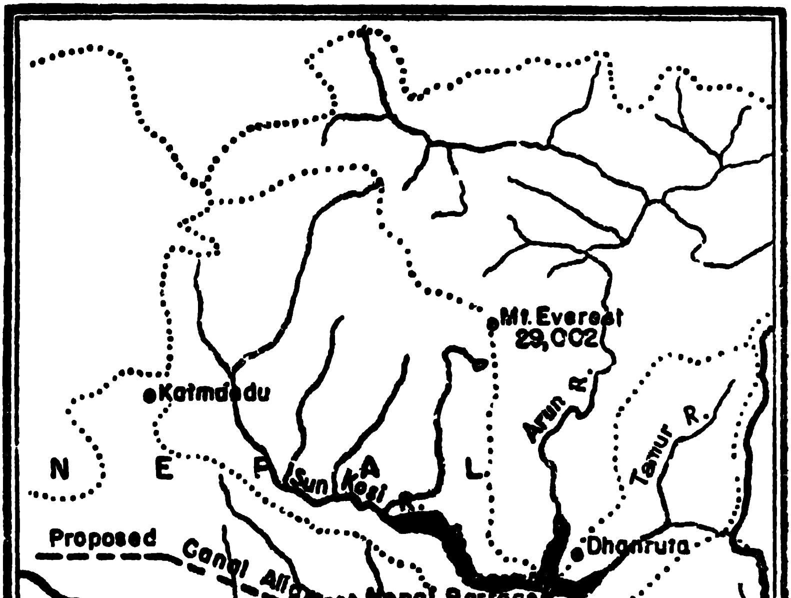


FIG. 33. The three unit Kosi scheme is primarily a flood control project which will yield other benefits also.

*The Bhakra and Nangal Project** is the only multi-purpose scheme in Punjab. The industrial development of Punjab till recently was retarded by the shortage of power. The State is without coal and petroleum fields. The remedy lies, therefore, in the development of hydro-electricity which will in turn facilitate agricultural production, through electrically operated tube-wells to make the area self-sufficient. Fortunately for Punjab

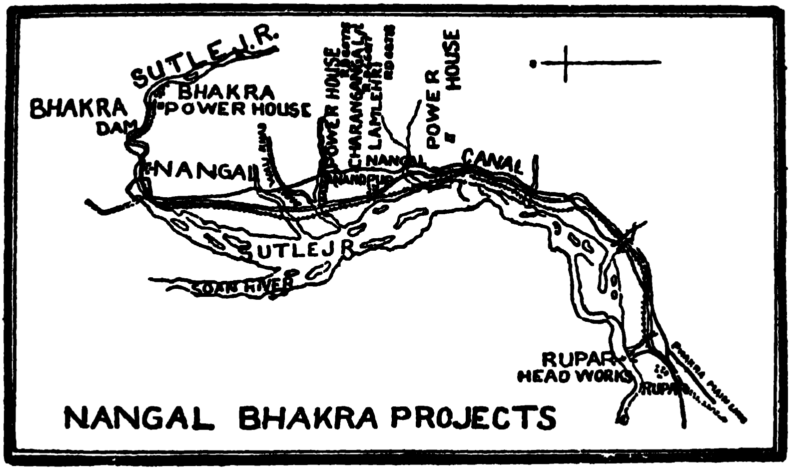


FIG. 34. "Bhakra-Nangal project is something tremendous, something stupendous, something which shakes you up when you see it. Bhakra today is the symbol of India's progress."—Nehru.

there are great possibilities for such water-power development at Bhakra and Nangal on the Sutlej river. The essential feature of the Bhakra project is a cement and concrete dam, 740 ft. high, across the river Sutlej at the site of Bhakra Gorge, about 50 miles upstream of the present headwaters of the Sirhind canal in Punjab. The total storage capacity of the reservoir is estimated to be 7·2m cubic ft. of which nearly 5·5m cubic ft. will be available for hydro-electric power generation and irrigation purposes every year. The reservoir level has been kept at 1,680 ft. above

* The Bhakra-Nangal project was first thought of by Sir Louis Dane, the then Lt. Governor of Punjab in 1908. Till 1940, nothing was done in the matter. Then the Punjab Government took it up for implementation, but had to give it up because of the 4 year injunction obtained by Sind on the Punjab Government. The ban expired on October 1, 1945. The actual work was however undertaken in 1948 after the partition of the country.

sea level. The dam ranks as the highest straight gravity dam in the world, and surpasses the Hoover Dam in Nevada (U.S.A.) which is 720 feet high.

Stored waters would provide irrigation facilities for nearly 6·6m acres of land and generate about 230,000 kilowatts of electric energy. An additional 170,000 kilowatts is produced on the Nangal hydro-electric canal which forms a feeder channel for the Bhakra canal system.

The length of the dam at the top is about 1,700 ft. and the width of the base at its widest point about 1,100 ft. A 30 ft. roadway is provided at the top. Partial storage of water above the Bhakra dam started in 1958, and in 1959 about 19·67 lakh acres were irrigated by the Bhakra Canal System in the Punjab and Rajasthan. On full development 36 lakh acres of land will be irrigated, and another 37 lakh acres will get increased water supply.

It will also help to get additional foodgrains of 1·3 million tons a year, cotton 0·8 million tons, sugar cane 0·5 million tons and oilseeds 0·1 million tons. No other river valley project in the world has so much food potential.

The Nangal scheme provides for an auxiliary dam or barrage across the river at Nangal, about eight miles downstream from Bhakra, to divert the river into the Nangal hydro-electric canal and serve as a balancing reservoir for taking up daily fluctuations from the Bhakra dam and for meeting daily and weekly load variations on power houses on the Nangal hydro-electric canal. The Nangal dam is a massive concrete weir 1,029 ft. long, 400 ft. wide and with its deepest foundations going down to 50 ft. below the river bed. The waterway consists of 28 bays 30 ft. wide, each provided with a steel gate to head up the water about 50 ft. above the river bed. The Nangal-Hydel channel takes off from the left bank of the river above the Nangal dam and is about 40 miles long. It has a carrying capacity of 12,500 cusecs. The two power houses are at Ganguwal, 12 miles down Nangal, and Kotla six miles further down. The Nangal-Hydel system supplies electric power to Rupar, Ambala, Karnal, Panipat, Hissar, Bhiwani, Rohtak, Nabha, Patiala, Ferozepur, Faridkot, Kalka, Kassauli, Simla, Jullundhur, Hoshiarpur, Kapurthala, Dhilwan and 49 other small cities. Electric power has been extended to Delhi, Gur-

gaon, Palwal and Rewari from Ganguwal and Kotla power houses since September 1957.

The hydel power is also used extensively for tubewell irrigation in several areas of Punjab which are not served by canals. Tube-wells also serve to de-water the water-logged areas and supply this water elsewhere in dry areas. In course of time power will be used for railway electrification, especially on the main line between Delhi and Amritsar.

The Rihand Valley Project is by far the most important multi-purpose scheme in the Uttar Pradesh. The dam at Pipri, in the Mirzapur district on the river Rihand which is a tributary of the Sone will be the largest reservoir in India. The dam will be over 3,000 feet long, and the storage capacity of the reservoir will be 90 lakh acre feet. The surface area of the lake created will be 180 square miles.

The scheme will confer numerous benefits on the country. (*a*) The eastern parts of the State do not have any proper irrigation system and entirely depend upon rainfall for crops. The scheme will make possible the construction of 3,000 tube-wells and 4,000 miles of pumped canals from the Gogra, Ganga and Jamuna rivers. Thus, large tracts of unbroken land will be cultivated for food production; (*b*) fish culture will be possible in the huge lake; (*c*) the canals will bring the unexplored region of the Sone valley in touch with the Ganga. Large cargo vessels will ply between the Hooghly and the Rihand; (*d*) industrialisation will take place in the wake of the Project. The region is one of the richest in mineral wealth; (*e*) some sections of the Northern Rly. can be electrified to save coal. The power raised from the water will result in the saving of 20,000 wagons of coal per year.

Other benefits of the scheme will be the control of floods in the Rihand and the Sone, lesser soil erosion in the Rihand valley, better afforestation in Rewa and restoration of marginal lands. Thus it is an ambitious undertaking designed to pave the way for the agricultural and industrial advancement of the eastern parts of the State and is destined to become a landmark in the development of India.

Rajasthan Canal Project

In order to provide water for irrigation to Bikaner, Jaisalmer

and Sriganganagar, covering an estimated area of about 2·6 million acres, there is a project for the construction of a canal from the river Sutlej at Harika barrage. The canal will be fed by flow supplies from the Ravi and Beas rivers. There is also a proposal to construct a number of dams on these two rivers to increase the supplies of water through the canal. The Rajasthan canal will be 291 miles long, lying entirely in Rajasthan.

QUESTIONS

1. What do you know of the Bhakra-Nangal multipurpose project? Discuss the economic advantages which East Punjab and Delhi are likely to derive from it when the project materialises.
(Delhi B.A. Hons. 1951 ; Rajputana M. Com. 1955).
2. Describe the geographical factors involved in large scale irrigation projects of India. Give two examples from some recent projects. What are the effects of excessive irrigation? (Rajasthan B.Com. 1960).
3. What do you understand by the term *multipurpose river valley project?* Mention the important projects under construction or consideration in Bihar and Orissa, and the advantages these provinces will derive from them. (Cal. B.Com. 1949 ; Rajasthan B.Com. 1962).
4. Discuss the irrigation system of India. Also state why different systems of irrigation are practised in India.
(Raj. B.Com. 1957 ; Agra B.Com. 1953 ; Delhi U. Hons. 1949).
5. Describe *two* major irrigation schemes under construction in India. Why is irrigation so essential there? (Agra 1953).
6. "Irrigation is indispensable over a large part of India." Comment on this statement and describe the existing irrigation facilities in Uttar Pradesh.
7. Write a short note on the Indus Waters Treaty. Discuss the effects of the treaty on the agriculture of Rajasthan and the Punjab.
8. Describe the various types of irrigation works in India and their economic importance.

CHAPTER VII

FORESTS AND THEIR PRODUCTS

India has 128 million acres of land under forests, *i.e.*, 20 per cent of the total land area. Throughout this vast forest-area there is a variety in the types of forest vegetation, depending on variations of climate and soil and on other local factors. About 12 p.c. of the total area may be classified as merchantable forest. From the point of outturn, Indian forests are classified as marketable and inaccessible. The marketable forests constitute 83 per cent of the total forest area. The bulk of marketable forests consists of non-coniferous type.

"In view of India's tropical climate, periodic monsoons, low forest productivity and predominantly agricultural economy, it has been urged that at least a third of the total area in the country should be under forests."

Forests are distributed as follows:

Himalayan region	... ...	20 p.c.
Northern Plain regions	... ...	7 ,,
Peninsular Hills and Plateau regions	...	50 ,,
Western Ghats and Coastal regions	...	10 ,,
Eastern Ghats and Coastal regions	..	12 ,,

The forests in India are very unevenly distributed. Madhya Pradesh, Assam, Orissa and Andhra Pradesh have the largest concentration of forests. They are most scarce in the Gangetic area.

Though there are more than 5,000 different species of trees in India, half of them are timber trees and the rest are shrubs and climbers. The extension of urban areas and the agricultural fields has resulted in the gradual decline of forests in India. There is urgent need for judicious exploitation and measures for increasing forest area for the country as a whole.

9

GEOGRAPHICAL DISTRIBUTION OF FORESTS

Area in thousand acres (1959-60)

States		Area	States		Area
Andhra Pradesh	...	12,302	Orissa	...	10,125
Assam	...	15,797	Punjab	...	831
Bihar	..	8,841	Rajasthan	...	3,260
Maharashtra	...	15,629	U. P. ...	...	8,479
Kerala	...	2,460	West Bengal	...	2,088
Madhya Pradesh	..	33,617	Jammu and Kashmir		1,380
Madras	...	4,757	Tripura	..	1,574
Mysore	..	6,413	Total India	...	128,024

There is no proper balance between agricultural and forest lands in India. While Madhya Pradesh, Assam, Andhra Pradesh and Orissa have sufficient forest areas, most of the other regions have much less than the minimum required for proper land use.

Broadly speaking, there are five types of forests in the country:

(1) Arid country forests, extending over a considerable portion of Rajasthan and the south of the Punjab. The most important tree is the babul.

(2) Deciduous forests extend over large areas in the sub Himalayan tract, and in the Peninsular India. Sal, teak and a great variety of other valuable trees are found in these areas.

(3) Evergreen forests occur in those areas where the rainfall is heavy. Such regions are the west coast of the Peninsula, and the Eastern sub-Himalayan tract. The trees are bamboo, palm, fern and Indian rubber.

(4) Hill forests. They vary according to elevation and rainfall. In the Eastern Himalayas and Assam the forests are full of oak and magnolia. In Assam pine trees grow abundantly at an elevation of 3,000 to 6,000 ft. Deodar, pine and oak occur in the North-Western Himalayas.

(5) Littoral forests occur on the sea coasts and along tidal creeks. The most characteristic trees belong to the mangrove family.

AREA UNDER FORESTS BY COMPOSITION

('000 square miles)

		1950-54	1955-58
(*a*) Coniferous	...	14	10
(*b*) Broad Leaved			
(*i*) Sal ...	...	41	41
(*ii*) Teak ...	...	17	22
(*iii*) Misc ...	...	206	196
		278	269

Indian forests have important protective as well as productive functions. They provide employment for nearly a million people such as wood-cutters, sawyers, carters, carriers and raftsmen and play an important part as suppliers of raw materials for various industries like timber (with 30,000 employees), matches, ply-wood, paper and pulp, pencil, rayon, resin and tanning. Forests also supply fodder and sustain 32 million livestock. In India, forests also have a moderating influence against floods and erosion and help maintain soil fertility. "Development of forestry and forest industries is also essential for raising the income of the tribal people who live in the forest areas."

The devastation and abuse of forests have brought about steady deterioration of physical and climatic conditions, the drying up of many springs, silting up of water channels and loss of fertility of top soils in many regions. Several parts of the country which were once cool and richly wooded are now arid. The Siwalik hills extending from the Punjab to Assam are almost bare ; their streams are choked with sand. The forest at Nurpur in the Kulu valley is a barren hillside. Deep ravines have been cut into the banks of the Jamuna, the Chambal, the Narmada and the Mahi. The Rajasthan desert advances towards the Gangetic plain at the rate of nearly half a mile a year over a front of about 100 miles ; desiccating winds and desert sands blowing through the Abu funnel are ruining annually over 50 square miles of fertile territory. If this progress remains unchecked, the Rajasthan desert will progressively engulf the fertile plains of North India. The shores of the sea, in Gujarat, are

strewn with advancing sand dunes. The hill-sides of the Himalayas in Kumaon, being fast eroded for want of trees, have lost their valuable top soil by erosion and thousands of square miles of fertile land have been thrown out of use. It is necessary that at least 60 per cent of the land area should be under forests for protection against erosion, floods and denudation in the Himalayas, Deccan plateau and other mountainous regions. Deforested mountains give rise to floods and soil erosion. If rivers are to be used properly for irrigation and navigation, mountains should remain forested. Forests are, indeed, mothers of rivers. In the plains, where the configuration of the ground is gentle, the irreducible minimum should be 20 per cent. In other words, the overall proportion of the forest area in India should be raised to 33 per cent.

The *Vana Mahotsava* festival was inaugurated in 1950 with a view to encouraging the planting of trees throughout the country in all waste lands unfit for cultivation, along canals, roads and railways. In the same year about 4 crores of trees were planted of which 25 per cent survived. In 1951 also 4 crores of trees were planted. Since then the *Vana Mahotsava* has become an annual feature for the plantation of trees for the production of fuel wood and soft wood. A scheme for the immobilization of the Rajasthan desert has been prepared, the principal features of which are as follows:—

(*a*) Creating a belt of forest 400 miles long and 5 miles wide, parallel to the Pakistan boundary and 5 miles inside Rajasthan;

(*b*) Creating oases of vegetation round railway stations, police stations, etc.;

(*c*) Establishing shelter belts along selected roads and railway lines;

(*d*) Creation of wind breaks round agricultural fields and adoption of improved agricultural practices.

The forest produce is divided into two main heads: (1) major produce, *i.e.*, timber and firewood and (2) minor produce, *i.e.*, comprising all other products such as lac, tanning materials, honey, wax, bamboo, thatching grasses, essential oil, turpentine, resin, cane fibres and katha.

"The total standing volume of timber in the country is estimated at 85,696 million c.ft. of which 80,002 million c.ft.

(93 per cent) are of non-coniferous and 5,664 million c.ft. are coniferous".

PRODUCTION OF TIMBER AND FIREWOOD (IN MILLION CU. FT.)

	1951	1956	1960
Timber	106	119	130
Round wood ...	30	24	28
Pulp and match wood ...	·6	1·4	2
Firewood	394	326	350
Charcoal	28	56	60
Total ...	558	526	570

In recent years, there has been considerable progress in the production of timber in India. This high production has been possible because of the following factors:

(*a*) Opening of inaccessible areas by the construction of new roads and paths;
(*b*) appearances of mechanical traction;
(*c*) increased demand for timber for constructional and other purposes; and
(*d*) exploitation of species hitherto unacceptable for trade and new industries.

Important timbers include deodar, sal, rose-wood, padauk, Indian mahogany and teak. Several industries are making use of wood directly as a material. The forests provide cellulosic raw materials in increasing measure for the production of paper needed for educational and other programmes.

Every advance in industrialisation will be reflected in an increased demand on timber. "Most advanced countries in the world are precisely those with the highest per capita consumption of wood. India's per capita consumption of round wood is 1·4 cubic feet as compared with 58 cubic feet in the U.S.A." There is considerable imbalance between the requirements of forest produce and forest resources of the country. It has been estimated that requirements of industrial wood which amount to 4·5 million tons at present would increase to about 9·5 million tons in 1975. Since forests are replaceable at a slow rate, and the demand for timber for industrial purposes is on the increase,

it is desirable that forests should not be exploited indiscriminately. "The craze for clearing and breaking up more and more land for extension of agriculture has swept over large areas of the country, and even reserve forests have not been altogether immune from expounding cultivation."

India exports fire-wood, hard-wood, sandal-wood and teak to Hong Kong, U.S.A. and other countries. In 1960-61, India exported a little more than Rs. 2 crores worth of wood and timber.

The forests of the country supply a large variety of minor forest products. Various plants and their derivatives account for items such as essential oils, resins, gums, medicinal herbs. flosses, edible wild plants, canes and grasses. In addition, animal products such as honey, beeswax, lac, bones, hides and horn play an important role of their own both in the home markets and abroad. The chief difficulty in organising the commercial exploitation of these products arises from their erratic distribution which reduces their economic value. While such well-known items as bamboos and lac are being cultivated or reared and utilised on a fairly satisfactory scale, better methods of rearing, collection, extraction and marketing should be possible with a view to ensuring quality as well as regular and adequate supplies of all minor forest produce.

VALUE OF MINOR FOREST PRODUCE

(In lakhs of rupees)

	1951	1956	1958
Bamboo, canes ..	152	137	134
Fibre, Flosses ...	·5	·5	·8
Gums and Resins ...	42	101	125
Other minor products ...	498	536	593
Total	694	801	854

Lac is secreted by a type of insects which feed on the saps of certain trees known as lac hosts. These trees are palas, ber and kusum, and are found in the south-eastern districts of Bihar, the western border areas of West Bengal, and adjoining districts of Bihar, Uttar Pradesh, Madhya Pradesh, Orissa and Assam. Chotanagpur in Bihar raises 60 p.c. of India's total.

At present, the production of lac in India is about 41,000 tons which is over 75 per cent of the world's output.

PER CAPITA PRODUCTION

Bihar	...	...	40
Madhya Pradesh	...	...	30
West Bengal	...	...	19
Maharashtra	...	...	6
Others (U.P., Assam, Orissa, Punjab, Mysore and Madras)	...	...	5

Lac industry engages over four million cultivators apart from several thousands engaged in the manufacturing industry and the trade.

The special characteristics of lac are as follows: —

(*a*) it dissolves easily in solvents such as spirit or aqueous alkalis ;

(*b*) it yields hard, smooth, glossy and rapid drying decorative and durable films which show excellent adhesion to a variety of surfaces ; and

(*c*) it is resistant to a variety of solvents particularly hydrocarbons.

Lac is used in making gramophone records, varnish, electric insulation, sealing wax, lithographic ink and others. About 35 p.c. of lac is consumed in the gramophone industry.

Only about 10 p.c. of stick lac is consumed in India, and the rest is exported. Best customers of the Indian lac are the U.S.A. and the U.K. About 90 p.c. of the total lac export is handled in Calcutta. Recently, the Indian lac industry has been threatened by competition from cheaper Siamese lac and the discovery of several special-purpose synthetics. The U.S.A. is now taking less Indian shellac for gramophone record manufacture. In 1960-61, India exported 27 million kilograms of lac and lac products and earned foreign exchange to the value of Rs. 6 crores.

Resin is derived from the pines of the Himalayas and Assam hills and is worked for making resin and turpentine oil. Resin is used for shellac adulteration, in paper mills, soap factories, etc., while turpentine is in demand for medicine and varnish.

Myrobalans grow in abundance in Madras, Maharashtra, Bihar, West Bengal, Orissa and other places. A variety is found in Coimbatore whose fruits are very small in size, but the tree is taller than the *peepul* tree of Northern India. The fruits, the bark, the leaves, the trunk—every part of the myrobalans has some use or other for us. The timber is very strong. The Jabalpore myrobalan is the best of all and is used for the preparation of medicine and dyes. *Myrobalan is a great toner in tanning.* The alkali of myrobalans is useful for preparing different dyes by mixing with various ingredients. In Madras myrobalans are extensively used for dyeing cotton, wool and skin. In Assam, *Endi* and *Muga* silk are dyed with myrobalan alkali. England, Germany, Belgium, Japan, the U.S.A. and Australia are the chief importers of Indian myrobalans.

In recent years, many forest products have also assumed great importance as raw materials for medicinal and perfumery purposes. Sandal-wood oil, palmorosa (from Rosha grass), linalol, and vetivert are important essential oils. Margosa (Neem) oil is regarded in India as a specific for skin diseases and is used in soaps. Drug-plants are also exploited in India and these include Atropa, Belladonna, Hyoscyamus, Podophyllume-modi, Nux Vomica, and Artemisia Previfolia. Other drugs include Aconite, Mentha, Juniper, etc.

The Forest Research Institute at Dehra Dun is engaged in (*a*) finding out suitable woods for aircraft construction, (*b*) producing cheap printing paper, (*c*) discovering indigenous woods suitable for use as battery separators, etc. and (*d*) investigating pencil woods. A systematic investigation of pencil woods has shown that not only is Indian deodar suitable for first class pencils, but is also superior to the East African deodar on which the Indian Pencil industry largely depends at present.

Many forest areas of the Himalayas are almost inaccessible because of steep and rocky slopes. The question of *bringing timber and other materials from forests to the road, railway or river that leads to the place of utilization,* is thus the main problem of the forest industry. At present two methods are

applied: (*i*) employment of bullocks, buffaloes and elephants as carriers of forest produce, and (*ii*) timber rafts are floated down the rivers during monsoon months to be dragged again from the water (after, of course, many days of floating) to the saw mills. "Forest roads need to be linked with trunk roads and river landings, so that the timber can be transported or floated easily."

The different States have been carrying out a number of schemes relating to afforestation, development of forest communications and foundation of small-scale plantations. The Second Plan included measures for (*a*) afforestation and improvement of poorer areas in the forests and extension of forestry; (*b*) formation of plantations of species of commercial and industrial value; (*c*) promotion of methods for increased production and the availability of timber and other forest produce in the immediate future, and (*d*) development of forest roads. The Third Plan has put special emphasis on measures which will help meet the long-term requirements of the country and ensure more economic and efficient utilization of the available forest products. New plantations will include 210,000 acres for teak, 40,000 acres for bamboo, 60,000 acres for match wood, 22,000 acres for wattle, 46,000 acres for fuel-wood and 325,000 acres for miscellaneous plantations. The Plan also provides for the development of about 15,000 miles of forest roads.

Some Important Commercial Timbers

The forests of India are the source of many kinds of timber with varied technical properties.

Baing (*Tetrameles mudiflora*) from Assam is a white soft wood.

Benteak from the West coast is a reddish brown moderately hard wood and has considerable demand for furniture, coffee cases, ship-building, etc.

Bijasal obtainable in Maharashtra, Madras and Bihar is a very hard, close-grained durable wood and is used for door and window frames, furniture and agricultural implements.

Blue Pine (*Pinas excelsa*) from Punjab is much used in constructional work.

Deodar (*Cedrus Deodara*) is a moderately hard wood,

strongly scented and oily and is used for railway sleepers and in building.

DHUPA found along the foot of the Western Ghats, besides giving the gum resin, is used for tea chests and packing cases.

HALDU (*Adina cardifolia*) is found all over India. It is a yellow, moderately hard, even-grained wood and is used for furniture and cigar-box-making.

INDIAN ROSE WOOD is world famous and is found mostly in the forests of the southern part of the Western Ghats. It is also available in M.P. and Orissa. Extremely hard and close-grained. this dark purple wood is the highest priced timber in India and is widely used for furniture making.

SHISHAM otherwise known as *Sisso* is available in Uttar Pradesh, Punjab and West Bengal. This wood is very hard, close-grained and brown in colour and takes a high polish. It is much used for carriage, cart and boat-building all over Northern India.

IRUL WOOD and MESUA (*Mesua ferra*) are found in Madras. Being very durable, they make excellent railway sleepers. Mesua is also available in Assam.

SAL (SHOREA *robusta*) is in regular demand in Northern India for building piles, beams, planking, door and window posts and for railway sleepers. This timber is available in Assam, West Bengal, Bihar, Madhya Pradesh, Orissa and Uttar Pradesh.

SANDAL-WOOD comes from the dry regions of South India and is a hard, close-grained, yellowish brown wood, strongly scented by the oil characteristic of the tree. It is in demand for making boxes and small articles, often beautifully carved. The oil of the wood is also important.

SEMUL (*Bombax Malabaricum*) is found widely in Assam, Bihar and Madras. The timber is soft and white and is used for toys, packing cases and planking.

SUNDRI (*Heriteira Species*), available in West Bengal, is used for boat-building, furniture, beams, planking and posts. The wood is very tough and hard.

TEAK (*Tectonia Grandis*) is extensively found in Madhya Pradesh, Madras and Maharashtra. As a ship-building wood and as a good wood for house carpentry, it has long been known in many parts of the world. In India it is a general purpose

timber for house and ship-building, bridges, railway sleepers, furniture, etc.

Arrangements have been made for the supply of Andaman timbers to the match and plywood industry in consequence of which the necessity of importing tea-chests has been obviated to a large extent.* Attempts are also being made to meet the chronic shortage of newsprint in this country by tapping the hitherto unexploited forest of spruce and fir in the Himalayas.

The timber experts believe that preserved and treated wood and pressurised bamboo could replace steel in a variety of ways. India has a wide variety of timber and a large surplus of bamboo in the forests. The timber-for-steel scheme, if successful, may solve the steel problem which is retarding industrial development not only in India but in other countries in Central and South Asia.

QUESTIONS

1. Is India rich in forest products? On a sketch map of India, show the regions with important timber resources. How are these utilised at present? Discuss the prospects of increasing exports of Indian timber to the world's markets.

(Delhi B.A. Hons. 1950 ; Delhi B. Com. 1955 ; Raj. M. Com. 1956).

2. "The forest is a national resource ; like a river-system, it is a multi-purpose resource." Explain the nature and extent of forest utilization in India.

3. Show the relationship between the distribution of rainfall and the distribution of the different types of forests in India. What are the principal commercial products from these forests? (Cal. B.Com. 1960).

4. Write short notes on the following:—
   (a) Timber production in India
   (b) Lac industry.

5. Discuss the importance of forests in the economic life of India.

* The tea industry is the mainstay of the plywood industry in India. The tea industry normally requires over 5 million tea chests per year. A major part of this is supplied by Indian plywood industry whose production in 1954 was 78 million square feet.

CHAPTER VIII

ANIMAL HUSBANDRY

Animal husbandry is an integral part of a sound system of diversified agriculture. The integration of crop production and animal husbandry ensures better utilization of farm bye-products, maintenance of soil fertility, fuller employment for cultivators throughout the year and increase in rural incomes.

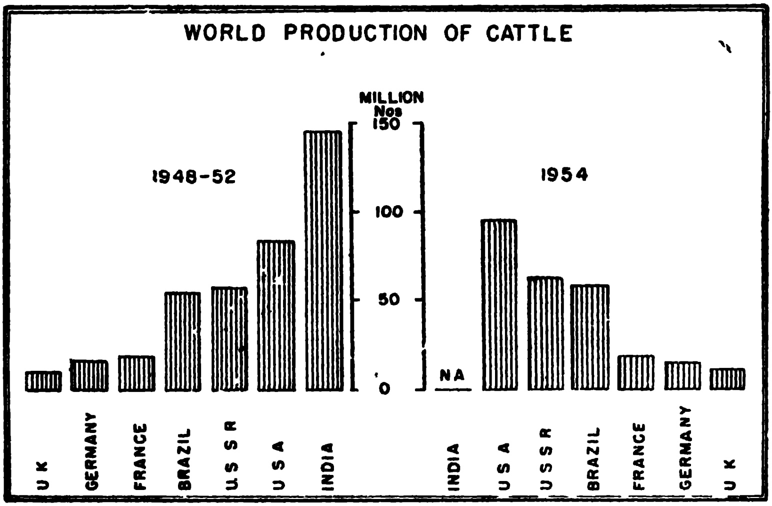


FIG. 35. Production of cattle in India *vis-a-vis* world

Though of poor quality, a large number of farm animals are maintained in India. India has the largest bovine population in the world.

CENSUS OF LIVESTOCK, 1956

(in millions)

Cattle ...	... 158	Goats ...	... 56
Buffaloes ...	... 44	Horses and ponies	... 1·5
Sheep ...	... 40	Total	... 306·5

Cattle are used for ploughing and for milk. "Without them the fields remain unpopulated, store and bin stand empty, and food and drink lose half their savour, for in a vegetarian country what can be worse than to have no milk, butter or ghee?" The cattle in India however are ill-fed and irregularly distributed. The present cattle population in India is considerably in excess of the available supplies of fodder. It is commonly considered that in relation to the supplies of dry fodder at least one-third of the cattle population may be regarded as surplus. Owing to the increase in the requirements of food for the human population, areas, where grazing was possible, have steadily diminished. Large numbers lead to poor feeding. The problem is being aggravated by a substantial annual increase in cattle numbers. It has been estimated that if the feed now being consumed by useless animals could be added to the rations of milch animals, there would have been a gain of 365 lbs. of milk per animal a year.* There are difficulties, however, in reducing the number of cattle in any effective manner inasmuch as there are sentiments against cattle slaughter. "Unless problems associated with excessive cattle numbers and the attendant shortage of food supplies are dealt with realistically, contributions of animal husbandry to increased food production will be extremely difficult." There are suggestions that there should be a graduated tax on cattle which would make the maintenance of useless cattle a burden on their owners. Compulsory sterilization of surplus cows is also recommended. The important cattle-breeding areas are Madhya Pradesh, Andhra Pradesh, the U.P., Mysore and Gujarat.

India stands fifth in sheep population with her 40 million sheep. Sheep in India are reared particularly in the Hissar district of the Punjab: Garhwal, Almora and Nainital in the U.P.; Gujarat, Mysore; and the Bellary, Kurnool and Coimbatore districts of South India.

The Sheep Raising Tracts of India

1. The Northern Region comprising Kashmir, Himachal Pradesh, Punjab and U.P.

* Report on India's food crisis and steps to meet it by agricultural production team sponsored by the Ford Foundation (April 1959) issued by Government of India.

2. The Western Region comprising Rajasthan, South-East Punjab, Western U.P. and Gujarat.
3. The Southern Region comprising Southern Maharashtra, Mysore, Madras and Andhra Pradesh.

The Indian sheep is inferior to that of Australia or South Africa as a mutton or wool producer. The wool of Northern India is white and of fair quality while in Peninsular India, it is grey, short and coarse. The average annual production is a little above 72 million lbs. "A good deal of the wool, which comes into the Indian market is dead wool, *i.e.*, what has been removed from the carcasses of slaughtered sheep and not shorn.[6]"

The average yield of wool per sheep is about 2 lbs., and this can be raised to 6 lbs. with improved varieties of sheep. The demand for wool comes from five main sources, namely, cottage industries, for carpets and floor rugs, for blankets, for manufacture of clothing material and knitting yarns in mills and for other industries like the manufacture of shawls, tweeds etc. There are sheep breeding farms and wool extension centres in Himachal Pradesh, Maharashtra and Madhya Pradesh. The annual production of wool at the end of 1965-66 is expected to go up to 90 million lbs.

The average annual export of raw wool is about 50 million lbs of which 36 million lbs are carpet wool and 15 million lbs are semi-processed wool. In 1960, the export of raw wool contributed Rs. 11 crores in foreign exchange. A frequent complaint of the foreign consumers about Indian wool is the presence of excessive foreign matter such as sand, burns etc. Accordingly steps are being taken to ensure correct shearing as well as systematic grading of wool.

Goats may be considered as the poor man's cheap milk animal. Goat's milk is highly valued for human consumption, but the yield of milk from goats is very small. There are over 57 million goats in India. These animals are valued for their meat and milk and in places for their hair. Goats are very prolific and they are easily domesticated. About 21 million pieces of goat skins are obtained annually. Mules and horses are used in India mostly for drawing carts. There are 2 million such animals in India and these are found chiefly in the Punjab,

U.P., and Maharashtra. Camels are mostly confined to Punjab and Western Rajasthan. In these areas camels are largely used for ploughing and as draught animals.

Animal products in India are hides and skins, bone, wool, milk, butter and ghee. Hides and skins are used for making harnesses, bags, suitcases, trunks, machine belts, automobile tops and seats, cases for guns, shoes and gloves. The term hide denotes the skins of cattle, horses and camels, while the term skin is restricted to those of calves, sheep and goats. In India the hides and skins are mostly collected from the slaughter-houses. West Bengal and Madras are the largest producers of cattle hides, Madras the largest producer of buffalo hides and sheepskins, and the Uttar Pradesh the largest producer of goatskins, followed by West Bengal and Bihar. The leather centres in India are Kanpur, Agra, Calcutta, Delhi and Madras.

The total estimated supply of raw hides in India is about 200 lakh pieces. Of this, nearly 40 lakh pieces or 20 p.c. are exported raw or after tanning. The remaining 80 p.c. are consumed by small and large tanneries for preparing leather suitable for different types of articles used in the country. About 37 million pieces of skin are obtained annually from goats and sheep.

Indian hides and skins are purchased by the U.S.A., Germany, U.K., France, Belgium, Iraq, Iran and Burma. India's capacity to export hides has become limited because of the partition. In 1959, India earned Rs. 29 crores of foreign exchange from the export of leather and leather manufactures.

The output of milk in India was 22 million tons in 1961. By 1965-66, the milk production will go up to 25 million tons. More than 50 p.c. of the milk is obtained from buffalo. India stands second in the volume of milk production, her output being exceeded only by the U.S.A. Her milk production is over four times the output of Great Britain, over five times that of Denmark, over six times that of Australia and over seven times that of New Zealand. The yield of milk per head of cattle in India is very erratic ranging between 5 and 17 lbs. per day. With a little attention, this can be raised to 15 lbs. per day per head of cattle.

U.P. contributes about 20 p.c., followed by Bihar (12 p.c.), Madras (10 p.c.) and Maharashtra (6 p.c.).

The average consumption of milk per head per day ranges from 1·3 ounces in Assam to 16 ounces in Punjab.

Of the total milk produced in India, about 38 per cent is estimated as being used for consumption as fluid milk, about 42 p.c. for ghee and the rest for khoa, butter, curd and other products. The progress of dairy industry in India has been very slow on account of scattered and small-scale milk production, inadequate transport facilities in most parts of the country, dependence on imported plant and machinery for milk processing and shortage of technical personnel. The dairy development activities in India are now being pursued with vigour in a number of places. The State of Maharashtra has made remarkable progress in dairying. At *Anand* in Kaira district (266 miles north of Bombay) a large butter factory has been started with a capacity of 10,000 lbs. of butter a day. Its tinned butter has a market throughout the country.* Modern dairies have been set up in Delhi, Poona, Kudgi, Kurnool, Guntur, Kodai Kanal and Haringhata. Milk product factories are located at Amritsar and Rajkot. In U.P. there are dairies at Aligarh, Kanpur, Lucknow, Banaras and Allahabad.

Ghee has considerable demand in India and is "prepared by practically every household by heating butter over a slow fire until an oil is formed that rises to the surface while the refuse settles down as sediment." Ghee is used in the preparation of food and sweetmeats. Buffalo butter gives greater yield of ghee than that of cow. The ghee-producing areas are the U. P., Rajasthan, Madhya Pradesh and Punjab. The annual production of ghee in India is about 14 million maunds.

The seasonal variation in the quality of ghee is always noticeable. The best ghee is produced during the winter while the ghee produced in the rainy season is of inferior quality. Cheaper and inferior fats are often mixed with ghee.

Of the total ghee production, nearly 30 per cent is retained by the producers for domestic consumption and the rest is marketed. Ghee is also sent to Malaya, Ceylon, South Africa, Mauritius and Hong Kong where a large number of Indian

* Anand area supplies 6,000 gallons of milk per day to Bombay city.

emigrants have settled. India also imports in normal years about 66,000 maunds of ghee, mostly from Nepal.

Recently the ghee trade has suffered greatly by the competition of vegetable oils. The establishment of ghee-grading centres is necessary for getting ghee graded and tested for purity.

Though there are several millions of people in India to whom meat is not forbidden by religion, the meat industry as such does not occupy any significant position in India's economy. The common meat animals are cows, goats and sheep. Pigs are also included in meat animals. The density of livestock in an area has little relation to the demand for meat. In Kashmir, West Bengal and Assam with highest per capita consumption of meat, the livestock population is not high.

Poultry. Poultry development gives a substantial source of supplementary food for the nation, a gainful subsidiary occupation for a large section of the people and rural employment, especially among educated farmers. Poultry production has tremendous potentialities in India because of (*a*) the efficiency with which poultry convert foodstuffs into human food, (*b*) the small investment required to get started, (*c*) their suitability as a family enterprise, (*d*) the small area required and (*e*) quick financial returns. In 1960 there were 130 million poultry birds. The importance of poultry in India may be judged from the fact that, domestic consumption apart, it is estimated that 60 per cent of hen-eggs and 80 per cent of duck-eggs are sold every year to the value of over Rs. 5 crores, the value of birds themselves being estimated at Rs. 7½ crores. The per capita availability of eggs per annum in 1960 was about 18 as against 296 in Canada. The average indigenous hen produces about 60 eggs per year in this country, as against 120 in many other countries. Commercial hatcheries are being set up in many States and regional poultry farms, which will increase the average egg production. A factor in poultry development is the loss which the poultry breeder frequently suffers from the outbreaks of diseases. A large proportion of the eggs produced during the hot weather are lost on account of the lack of proper preservation including cold storage. Regional poultry farms are being set up in Delhi, Himachal Pradesh, Bangalore, Bhuvaneshwar and Bombay.

QUESTIONS

1. "Animal husbandry is an integral part of a sound system of "diversified agriculture." Explain this statement with reference to Indian conditions.
2. What are the principal animal products in India?
3. Write short notes on cattle rearing and dairy farming in India. (Cal. B.Com. 1953).
4. Discuss the economic importance of the livestock in India. What are the defects of the Indian livestock?
5. Can poultry keeping be a common form of animal husbandry in India? What potentialities are there for poultry keeping in India?

CHAPTER IX

THE FISHERIES

With about 3,000 miles of coastline and several million acres of inland waters, India's fishery resources are large The importance of fishing lies in the immense potentiality of that article in the food resources of this country Notwithstanding the prevalence of vegetarianism a large number of every caste and creed in India are accustomed to use fish in their daily diet As a source of food, fisheries stand almost equal to agriculture and animal husbandry When land cannot produce enough to feed a country's population its water must be exploited in an effort to find more food

Of the total population only about 16 per cent of people do not take fish because of religious sentiments In many cases among the non vegetarians, the preference for vegetarian diet is because of non availability of fish or its high price

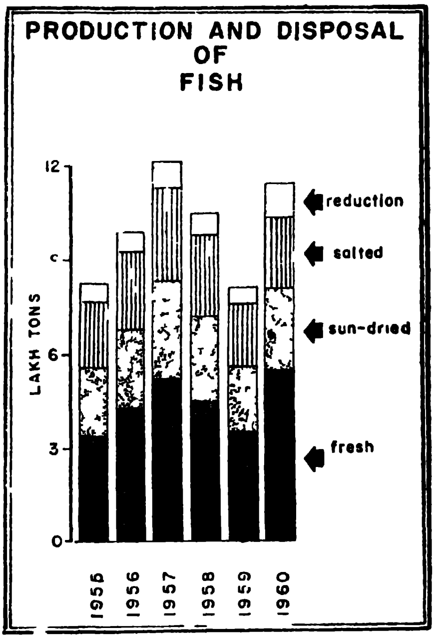


Fig 26 Production and pattern of Disposal of Fish

The chief sources of supply are the coastal margins of the sea, river, estuaries, and backwaters for marine and estuarine fish, and rivers, canals tanks, inundated tracts etc for freshwater fish

Although the maritime and riverine fisheries at present occupy a very minor place in the national economy of India, the industry contributes about Rs 60 crores annually to the national

income. About 75,000 fishing crafts which ply along the country's extensive coastline provide work for about 1 million fishermen.

It is estimated that the annual fish production is about 1·4 million metric tons, of which about two-thirds of the country's fish production come from the sea.

The requirements of the fish-eating population in India are estimated at 4·5 million tons. The present production, therefore, falls short of demand by about 60 per cent. Fortunately, however, Bay of Bengal and the Arabian Sea are rich enough to meet this requirement.

FISH PRODUCTION IN INDIA

(in thousand metric ton)

Year		Marine	Freshwater	Total
1955	..	586	240	826
1956	.	707	289	996
1957	...	875	358	1,233
1958	...	755	309	1,064
1960	..	1,050	350	1,400

The total landing of marine fish by States is shown below (where available):

(In metric tons)

		1957	1958
Andaman (South)	...	96	92
Andhra ...	...	40,462	28,846
Bengal (West) and Orissa (North) ...	...	4,509	3,593
Maharashtra ...	...	356,660	222,886
Kerala ...	...	309,926	294,655
Madras			
(i) East Coast	...	48,592	55,265
(ii) West Coast	...	31,092	62,791
Mysore ...	...	76,090	80,242
Orissa (South)	...	3,757	2,674
Mechanised vessels	...	4,332	4,730
Total ...	...	875,516	755,774

Indian Union has a coastline of 3,000 miles exclusive of indentations and the total area of the sea which lies between the coast and 100 fathom line is approximately 110,000 square miles. At present sea-fishing is carried on within 10 fathoms in the sea. The sea-fisheries are confined to the coastal waters from the shore in Gujarat, Canara, Malabar Coast, Gulf of Mannar, Madras Coast and the Coromondal Coast. All major marine fisheries are confined to comparatively shallow waters over narrow belts of continental shelves and slopes. In these areas also the good fishing grounds occupy only a fraction of the entire belts between the coastlines and the continental slopes. The greater depths beyond the 100 fathom line are almost barren from the standpoint of commercial fisheries. The unsuitability of the vessels, limitations due to climate, absence of suitable harbours and the lack of refrigeration, transport and marketing facilities are serious handicaps in the way of the development of the marine fisheries of India. For the rational utilization of the sea, it is necessary to ascertain the behaviour of the water by studying the physical, biological and chemical aspects of oceanography. So far very little is known about the characteristic of the coastal waters of India. Most varieties of fish caught along the coasts are edible. The principal catches are herrings, mackerel, prawns, Jew fish, cat-fish, mullets, pomfrets and Indian salmon. Mackerel accounts for over a third of the total catch and is found chiefly in the west coast of Madras, Kerala, Maharashtra and Gujarat coast. Herrings account for over 15 per cent of the total catch. Prawns occupy the third rank with 9 per cent. Pomfrets, mullets and the Indian salmon, although very popular, are caught only in comparatively small quantities, the respective percentage being 1·7, 1·9 and 1·3. The type of fishing implements includes drift nets, cast nets, stationary nets, etc. In the sea fishermen catch fish very near the shore and do not go beyond a distance of 5 to 7 miles.

The Deltaic fisheries are confined to the estuaries, backwater areas, lagoons etc. and generally constitute very rich potential fisheries. While the fisheries in some areas, such as the Chilka Lake in Orissa and backwaters in Madras, Kerala are extensively exploited, those on the extensive deltaic area of the Sundarbans and the delta of the Mahanadi are hardly tapped. The back-

waters of Kerala covering about 300 square miles offer excellent grounds for development of estuarine fish-farming for rapid-growing species of mullets, bhetki, pearl spot etc.

Production of Sea Fish by Groups and Species

	1956 Metric Tons	1957 Metric Tons	1958 Metric Tons
Marine Fish			
Flounders, halibuts, soles, etc	9,122	3,687	—
Cods, Hakes, Haddocks, etc.	1,308	1,138	—
Herrings, Sardines, Anchovies, etc.	114,014	292,999	—
Tunas, Bonitos, Mackerels, etc.	56,831	139,356	—
Miscellaneous Marino Teleosteans	356,015	278,348	—
Sharks, Rays, Skates, etc.	21,856	23,080	—
Crustaceans	159,552	136,812	—
Total marine fish	718,698	875,420	755,700

The estuaries of the Mahanadi and the Ganga stretching from Puri to Hooghly contain cock-up, hilsa, pomfrets, prawns, catla, cat-fish, rohu, etc., which are caught by trawl-type nets, drift nets and gilling nets, casting nets, bag nets, etc.

The river fisheries at present constitute the mainstay of inland fisheries of the country and are carried out in rivers, canals, irrigation channels, tanks, ponds, etc. The extensive expanses of the Gangetic system in the U.P., Bihar and West Bengal, the Brahmaputra in Assam, the Mahanadi in Orissa, the Narmada, the Tapti, the Godavari, the Krishna and the Cauvery systems are the main areas. Fishing in the Ganges system is very important. In these parts, people always prefer freshwater fish. *The estimated marketable surplus in the country is in the neighbourhood of 4 million maunds of fish.* West Bengal leads both in availability of fish as well as in value with 29 per cent and 36 per cent respectively. Bihar is a close second and Assam third in regard to the available surplus and the three States of West Bengal, Bihar and Assam account for nearly 72 per cent of the total freshwater fish marketed in India. Madras, the leading State in the production of sea-fish, catches only 4·7 per cent of the Indian total so far as freshwater fish are concerned. The Mahanadi in Orissa and the Ganga and its tributaries in U.P. yield 8·3 and 3·8 per cent respectively of the Indian total.

The great problem that lies in the way of developing the fish industry in India is that people are accustomed to the con-

sumption of certain varieties of fish and these only. Wide publicity and propaganda are necessary to enlighten the people as regards the nutritious value of fish not consumed at present.

The average *per capita* consumption of fish in India is 4 lbs. per annum, West Bengal being the leading consumer having 6 lbs. per capita consumption. In the Punjab, it is 0·9 lbs. and in Bihar, 2 lbs.

One half of the total production is consumed as fresh fish: one-fifth is cured by salting, another one-fifth is simply sun-dried, while about 10 per cent is converted into fish fertilizers.

Andhra and Madras with a coastline of 1,250 miles make a fishing ground in the shallow water area of 40,000 square miles. The fishing population is very large, but the methods are very primitive. There are about 250,000 fishermen in the Madras State who land annually 73,000 tons of sea-fish. The estimated landing of inland fish is 40,000 tons. Drifters and trawlers are never used. Country boats are engaged in catching sardine, mackerel, Jew fish, ribbon fish, etc., in the shallow waters around Ganjam, Gopalpur, Vishakhapatnam, Cocanada, Masulipattam, Nellore, Madras, Pondicherry and Nagapatam on the east coast and Kozhikode and Mangalore on the west coast. Deep-sea fisheries are being slowly developed in Madras.

Kerala with a coastline of about 300 miles raises more than 20 per cent of the total sea-fish landed in India. The main catches are sardines, mackerel and prawns. Further exploitation of the fisheries' resources of the sea off Kerala is being carried on under an Indo Norwegian project. The coastline as well as the existence of a number of tanks has made *Mysore* an important area for fish production. The production from the Sea Coast in Mysore is about one-seventh of India's total.

Fish is considered an important item in food for daily use in Bengal, and about 96,000 people depend on fishing industry in the State. But fishing is confined to inland waters; the sea-fisheries are as yet little exploited. The total quantity of sea-fish from Bengal coast comes to about 577,000 maunds. The kinds of sea-fish caught are pomfret, bhetki, prawn, tapsi, chanda, ribbon, skate, etc. If proper attempts are made, the Bay of Bengal can yield large quantities of high-class fish. As a result of the partition, the State of West Bengal has been

adversely affected in the matter of fish supply. Calcutta used to get 80 per cent of its fish supply from places now in Pakistan. The State's annual requirements are about 10 million maunds, but the supply at present does not exceed 700,000 maunds. Calcutta needs 6,500 maunds daily. Orissa supplies a large quantity of sea-fish to West Bengal. One of the easiest ways of getting fish in West Bengal is to grow fish in ponds. There are many ponds in the State. The people can grow fish, particularly Rohu and Mrigel, which can be fed in a pond like poultry in a yard. The fish are fed on boiled rice, potatoes, house-refuse and so on.

In Maharashtra fisheries are concerned almost entirely with the exploitation of the wealth of the sea. Maharashtra has a coastline abounding with excellent harbours for fishing craft, a fair weather season lasting for some seven months, and a fishing population more alive to their opportunities and more daring than those of Kerala and Gujarat. The important varieties of fish caught along the coastline are pomfret, Jew fish, Indian salmon, mullet, mackerel and sharks. The important fishing grounds are along the coasts of Great Bombay, Surat, Broach, Ratnagiri and Canara. Facilities exist at several places for curing, storage and refrigeration.

The coastline near Gujarat abounds in sea fish like pomfrets, prawns, Jew fish, Indian salbat etc. Veraval in Junagadh is to develop fishing facilities by deepening the creek and constructing wharf walls for fishing vessels to be anchored easily.

Bhopal has a great scope for the development of fisheries. *Bhopal's three main rivers—the Narmada, the Baitwa, and the Parvati, with their tributaries, constitute the chief sources of fish. Also there are a large number of perennial and semi-perennial tanks, which can be utilized for raising fish.* In Orissa and Assam, reclaimed marshy areas can be a good source of fresh-water fish. Paddy-cum-fish culture is practised in Kerala, Madras, Andhra and in some parts of West Bengal.

There is practically no fish-canning in India. The demand for canned fish is small and is met by imports. Difficulties in developing this industry are the absence of regular supplies of fish, lack of good and cheap containers and the short canning season. In India fish is preserved by desiccation with or without salt and by the use of antiseptic preservatives such as brine,

vinegar, etc. The fishermen in India practise desiccation by drying fish in the sun as the process is simple and handy. During the monsoon when sun-drying is difficult, salt is used. *Canning* is the best method applied for preserving sardines, mackerel and prawns and is practised on a limited scale in Madras and Bombay. The fish are beheaded and thoroughly washed after which they are put in saturated brine and then dried. In the last stage, the fish are packed in cans filled with oil.

As fish is a highly perishable commodity coupled with the fact that the climate, too, is sub-tropical, the need for ice-cold storage, processing and canning is great. At present because of the transport difficulties, the fresh fish is consumed in areas located near the coast or in the neighbourhood of landing places. Refrigerated railway wagons and freezing facilities for movement of fish in good conditions to consuming areas will ensure a balanced relationship between demand and price. The Government of India has set up a chain of well-equipped pilot fishing stations along the coast of India. Stations are located at Mangalore, Bombay, Cochin, Vishakhapatnam and Port Blair. Each station has a cold storage plant with a capacity of 500 tons and refrigeratory motor vans for carrying fish to inland market by road.

One of the aspects of fisheries development in India is the formation and running of fisheries co-operatives for preventing exploitation by middlemen, removing the indebtedness of fishermen and increasing production. Fishermen do not generally own boats, nets and other fishing equipment. The middlemen who provide these requisites take as much as 50 per cent of the net sale proceeds from the fishermen as charge on hire. There are now about 2,100 co-operative societies mostly in Maharashtra, Gujarat, Kerala, Madras and Andhra Pradesh. Then again, with the craft now in use, the activities of fishermen are confined largely to a coastal belt of about 7 to 10 miles so that fish resources further away or in deeper waters are exploited only to a very limited extent. It will be possible to increase the production in off-shore waters, if fishing methods are improved and the fishing craft are mechanised.

In the Third Plan, the lines of development of fisheries are as follows: (*a*) expanded mechanisation of existing fishing craft;

(*b*) introduction of new types of coastal fishing craft; (*c*) commercial fishing on the high seas by modern vessels; (*d*) installation of adequate shore facilities for storing, freezing and processing of fish; (*e*) improved methods of fishing in deep inland waters; (*f*) fisheries co-operatives; (*g*) fish transport by rail; (*h*) improved marketing; and (*i*) establishment of canning, fish meal and ancillary industries. The production is expected to rise to 1·8 million tons by 1965. Export of fish may go up from about Rs. 6 crores to about Rs. 12 crores.

Certain industrial products are also obtained from fish in India. These are fish-oil, fish-meal, fish-manure, fish-maws and shark-fins. The pearls are secreted by the oyster in the same manner as it builds up the nacre of the shell. In fact, the pearls are the same substance as the nacre with this difference that they are built in a rounded shape. A few tiny worms find their way into the oyster shell and die there. The oyster then begins to build round dead worms the beautiful pearls which are white in colour and brilliant in lustre. The oysters require six to seven years to produce pearls. Commercially pearl fishing, one of the oldest industries in the world, is very valuable. Pearls are mentioned in the Vedas, and there was a regular commerce for pearls between India and the ancient states of Rome, Egypt and Greece. Tuticorin in Madras has always been the centre of this industry in India. There are two types of oysters which are sought after: the *window-pane* oyster whose shell is used for decorative purposes, and the true pearl oysters. Window-pane oysters are found in the open sea off the Coromondal coast, Madras coast and Cochin coast. The waters of the gulf dividing Indian Union from Ceylon and of the Arabian Sea near the edge of the Kathiawar peninsula, as well as of the Gulf of Cutch, are rich in oyster beds, yielding highly valuable pearls. Unlike the Japanese oysters which are found in shallow waters in sheltered bays, the Indian variety thrives in the deep sea and has so far failed to acclimatize itself to a shallow water existence.

Certain maritime states have built up an export trade in preserved fish to Ceylon, Burma and countries in the Far East. The export depends, to a certain extent, upon the nature of the fishing season along the south-west coast of India, a favourable season resulting in an increased exportable surplus. Madras and Kerala are the chief exporting areas. Ceylon is the princi-

pal buyer, the average of her share being 80 per cent, followed by Burma.

Though there is practically no import of raw fish into India, considerable quantities of preserved fish are imported. The value of imported fish in 1960-61 was Rs. 3 crores.

QUESTIONS

1. What are the essential conditions for the development of fishing industry? Do you think that West Bengal possesses such facilities?

2. Give an informative account of the sources of fish supply in India.

3. Describe the development of fisheries in India. What lines of improvement would you suggest in this regard?

4. Give a short geographical description of inland fisheries in India.

5. "When land cannot produce enough to feed a country's population, its water must be exploited in an effort to find more food." Examine this statement with reference to India.

CHAPTER X

MINERAL RESOURCES

Nature has been very kind to India in the endowment of mineral resources. In recent years much progress has been made in the mineralised areas, and many new mining regions are being found out. In 1960 about 500,000 persons were employed daily in all the mines in India. Of these 350,000 persons were employed in coal mines.

Of the various minerals found in India, the most important are coal, manganese ore, gold, mica, iron ore, and salt. She is the world's main source of supply of ilmenite, monazite and zircon and mica. The mineral resources of the Indian Union encompass a sufficient range of useful products that are required to make a country industrially self-contained. The division of India has not affected the Indian Union very much in the matter of minerals. Except for petroleum, chromite, gypsum and Fuller's Earth, India has a complete monopoly of all other minerals of undivided India. With regard to non-ferrous metals like tin, lead, nickel and zinc, the country is not self-sufficient as she has to depend on other countries for about 75 per cent of her requirements. Indian minerals can be grouped as essential, strategic and scarce.

Minerals like coal and iron are considered *essential* because of their vital role in the industrial development. Minerals which are important for developing industries from the point of view of political safety against attacks and invasion, are *strategic minerals*. *Scarce minerals* are those which are important but have limited supplies.

Considering the size and population of the country, the mineral wealth is not so vast as it is supposed to be. India's position with regard to supply of industrial minerals is as follows: —

(I) Minerals in which India has large exportable surplus to dominate world markets:

Iron ore	Titanium ore	Mica

(II) Minerals of which the exportable surplus forms an important factor:

Manganese ore	Steatite
Magnesite	Silica
Bauxite	Monazite
Refractory minerals	Beryllium
Natural Abrasives	Corundum

The credit for discovering the presence of monazite in the sands all over the beaches of Travancore and Cochin goes to a German scientist—W. D. Schemberg—who did it in 1909. As rains erode the rock in the Nilgiris and other adjacent hills, the particles are moved and washed into the ocean as sands. Some of these sands as a consequence of a peculiar force of sea currents are swept back and deposited on the beaches. Monazite, ilmenite, zircon, garnet and silmenite are obtained from such sands. Monazite sands can be processed to yield thorium, cerium, and other rare earths which India has been importing for use in various industries, such as the gas-mantle industry and metallurgical operations for manufacture of special flints, aluminium base alloys, etc. Traces of uranium, used in the production of atomic energy, may also be present in Monazite sands. The Government of India has started a factory at Alwaye (Kerala) to work monazite for thorium and uranium.

(III) Minerals in which India may be considered self-sufficient:

Coal	Gypsum
Cement materials	Glass sand
Gold	Borax
Aluminium ore	Pyrites
Chrome ore	Nitrates
Building stones	Phosphates
Marble	Zircon
Slate	Arsenic
Mineral pigments	Barytes
Industrial clays	Precious and semi-precious stones
Sodium salts and alkalis	
Limestone and Dolomite	Vanadium

(IV) Minerals in which India has to depend largely or entirely on foreign imports:

Silver	Molybdenum
Nickel	Platinum
Petroleum	Graphite
Sulphur	Asphalt
Lead	Potash
Zinc	Fluorides
Tin	Antimony
Mercury	Copper ore
Tungsten	

India's position with regard to the production of *base metals* like copper, lead, zinc, tin, nickel and antimony is extremely unenviable inasmuch as in all these metals she is dependent on foreign supplies.

The position of India with regard to sulphur is serious. Although current consumption does not exceed 180,000 tons a year, the indications are that with the increase in the output of chemicals and fertilizers, the requirements will go up. Unfortunately, India does not produce sulphur at all and depends on the U.S.A. and Italy. Before the partition of India, the only source of sulphur was Baluchistan (now in West Pakistan). India imports about 1·5 million cwt. of sulphur a year.

The production of **lead** ore in the country is not sufficient for her requirements. Normally India requires about 30,000 tons of lead while the production is hardly 3,600 tons. Lead is therefore to be imported from Australia, Burma and U.K.

The principal lead mines in India are in Udaipur and Jaipur, both in Rajasthan. Lead ore reserves are estimated at about 11 million tons.

India requires **nickel** for engineering and chemical industries. Unfortunately, however, there is not a single nickel mine in this country nor do we find any possibility of getting this material from the country in near future. India normally imports about 1,000 tons of nickel most of which comes

from Canada. In future nickel mines may be developed in Manipur, Kashmir and Bihar where deposits are known to exist.

India consumes about 4,600 tons of tin annually in the electrical goods industry, the metal container industry and the pharmaceutical industry. At present there is no tin mine in India and the entire requirements are met by importing tin from Malaya, Singapore and other countries. India consumes about 7,000 tons a year, and this will rise to 10.500 tons in 1965-66. The feasibility of putting up a tin smelter based on imported concentrates from Thailand, Indonesia and Malaya is being considered.

India produces a small quantity of zinc concentrates from the Zawar mines of Udaipur district, Rajasthan. In the absence of a zinc smelter in India, zinc concentrates are sent to Japan for smelting. India imports zinc ore from Rhodesia, Australia, U.S.A. and Holland. India imports about half a million tons of zinc a year. The annual requirement of zinc is for 85,000 tons which will increase to 187,500 tons by 1965-66.

Many of the minerals like manganese, mica, ebonite, chromite, refractors, etc., are worked solely for the purpose of export. In the drive to earn more foreign exchange, the minerals have played a significant role.

VALUE OF PRODUCTION AND EXPORT OF MINERALS

(ORES AND CRUDE)

(in million rupees)

	Production	Export
1957	1,293	641
1958	1,273	460
1960	1,590	517

In 1958-60 the share of U.S.A. in India's total export value of minerals was about 28 p.c., followed by Japan with 20 p.c., U.K. with 11 p.c., Pakistan with 6 p.c. and West Germany 5 p.c.

PRODUCTION AND DEMAND FOR MINERALS (1958-61)

(In million tons)

	Production	Current Consumption
Coal	51·8	51·8
Petroleum	0·2	6·0
Manganese Ore ...	1·2	0·3
Iron Ore	10·5	8·0
Chromite	0·10	0·02
Tungsten*	3·0	3·0
Nickel*	—	1,020
Titanium Ore ...	0·25	0·01
Copper Ore	0·44	0·07
Bauxite	0·38	0·10
Zinc Ore	0·01	0·06
Gypsum	0·98	0·98
Tin*	—	4,550
Graphite*	1,500	2,500
Asbestos*	1,683	30,000

Unlike agricultural crops, mineral products are fixed in quantity; they cannot be increased or replaced. Once the minerals are extracted from the earth, they are gone for ever. It takes probably millions of years for Nature to turn earth substances into minerals. From a practical viewpoint, therefore, mineral deposits are exhaustible. India is very fortunate in the sense that not much progress was made in the mining industry of the country during the pre-independence era. Not only the existing mines contain sufficient reserves, there are also a large number of fields which are yet to be developed. Nevertheless, the rapid industrialisation of the country will result in the shortage of certain minerals in the near future unless new fields are discovered. Since it is the policy of the Government to see that the mineral wealth of India is utilized for the benefit of Indian industries, control of the unrestricted export of raw manganese ore, chrome ore, mica, titanium ore, phosphatic

* In Tons.

materials and refractory materials in general, as well as a better adjustment of minerals, export and import tariff are the measures in our planned economy of the nation's mineral wealth. Measures for conservation include avoidance of waste in mining and processing, and the substitution of scarce materials by those which are abundantly available in the country.

Iron Ore

Iron is by far the most useful of all metals. In fact modern civilization could not exist without it. One of the most significant features of the present economic organization is that it is animated by the use of power; without iron the extensive use of mechanical devices driven by the energy from coal, petroleum and water would be impossible. Iron has contributed enormously to the development of the modern mechanical age, but,

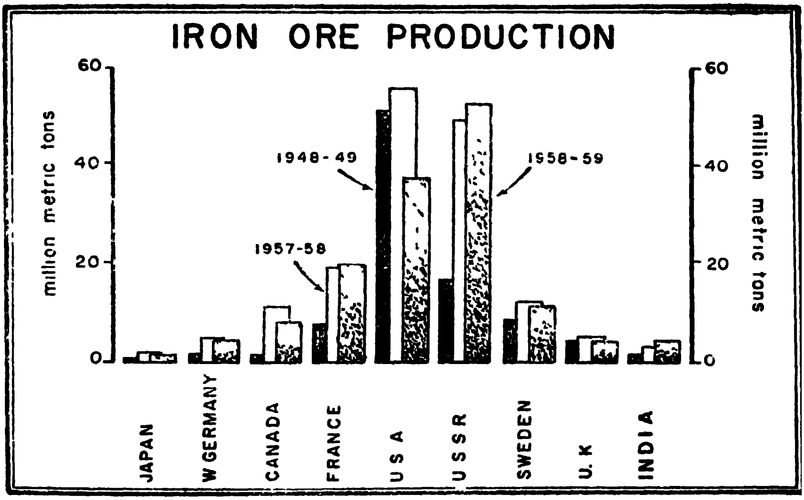


FIG. 37. Notice the towering position of U.S.S.R. and U.S.A. in iron ore production between 1948 and 1959. The graph also shows the gradual increase in the case of India, U.S.S.R. and France, and decline in U.S.A., Canada and Sweden.

on the other hand, the mechanical age has created the present demand for iron. Here, cause and effect are linked in a continuing process.

The value of an iron ore deposit depends not only upon its richness in iron, but also upon its location and the ease or difficulty of mining. India is fortunate in this respect because most of her iron-ore fields are found within easy reach of coal-fields. Dolomite and limestones necessary for smelting are also found in the neighbouring areas.

India's position with regard to coking coal and lime-stone which are vital for iron-making is not satisfactory. It has been estimated that coking coal and limestone may not last more than 70 years and 20 years respectively, and that with increased production of iron, "India will have to depend more and more on coal washeries and on beneficiation of lime stone."

India is the second largest iron-ore-producing country in the Commonwealth and occupies the ninth place in the list of the iron-producing countries of the world. Her resources of high grade iron ore are perhaps the greatest in the world, with the possible exception of Brazil.

According to a U.N, expert committee, India's iron-ore reserves are estimated at 21,000 million tons, *i.e.*, about $\frac{1}{4}$ of the world's total resources.

In 1962 the production of iron in the Indian Union was 9·7 million tons compared to 2·9 million tons in 1950. The output is influenced by the demand of the iron and steel industry which is again often handicapped by shortages of coal and transport facilities.

GEOGRAPHICAL DISTRIBUTION OF IRON ORE PRODUCTION, 1958

(in '000 tons)

Andhra	402
Bihar	3,229
Maharashtra	311
Madhya Pradesh	411
Mysore	1,020
Orissa	2,581
Total	7,903

There are four different types of iron ores in India—magnetite, laterite, clay iron stone and haematite. The haematites are the most valuable iron ores in India, and both in quantity and quality they exceed any other ores of the same kind including the great American occurrences.

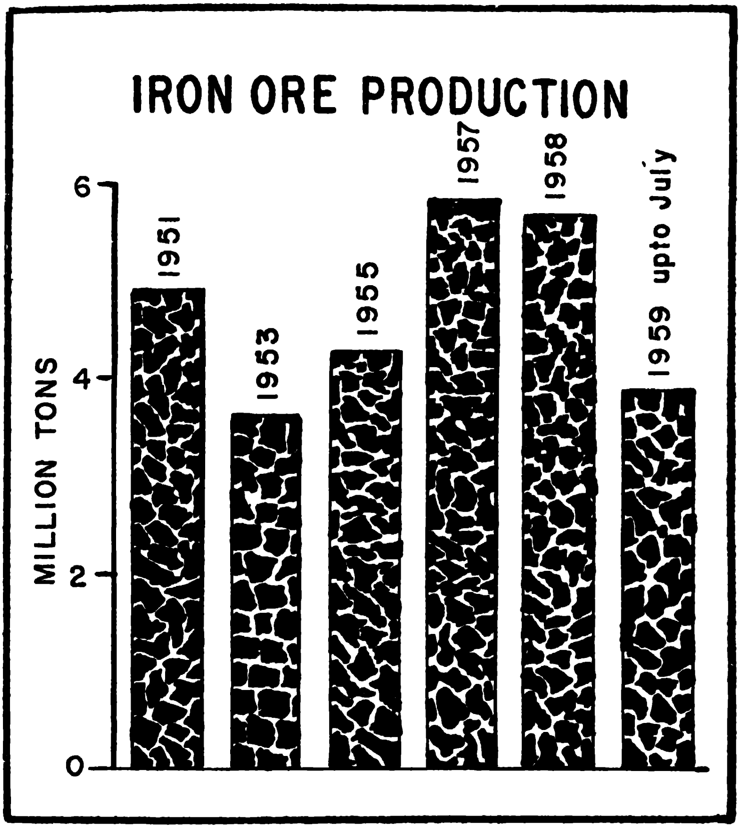


FIG. 38. Production of iron ore in 1962 was 9,681,000 tons, that is, an increase of 30 p.c. over 1958 production.

Though deposits of iron ore of good quality are found in many parts of India, the most important fields are confined to Bihar and Orissa. The less important areas are in Madhya Pradesh, Madras, Mysore and Maharashtra. Maharashtra's position is comparatively important inasmuch as the two fields at Lohara and Pipalgaon in Chanda district produce more than 800 tons of iron ore a year.

IRON-ORE RESERVES IN INDIA

DEPOSITS OF 60 PER CENT AND OVER
(million tons)

	Geological Survey Estimates	Probable
1. *Haematite Ores*:		
Bihar and Orissa:		
Singhbhum	1,047	
Keonjhar	988	
Bonai	648	
Mayurbhanj	17	
	2,700	8,000
Madhya Pradesh and Maharashtra:		
Lohara	20	
Pipalgaon	3	
Asola-Dewalgaon . .	2	
Dalli-Rajhara hills	120	
Bailadila	610	
Rowghat, etc.	740	
Jabalpore (different grades)	5	
	1,550	3,000
Goa-Ratnagiri	7	
Hyderabad	36	
Madras, Andhra & Mysore:		
Veldurti (Kurnool)	7	
Mysore	120	1,000
Sandur (Bellary)	130	250
Total Haematite Ores ...	4,500	12,250
2. *Magnetite Ores*:		
Madras, Andhra and Mysore:		
Salem-Trichinopoly	305	1,000
Mysore	130	200
Bihar and Orissa:		
Singhbhum-Mayurbhanj (Ti-V Ores)	2	
Palamau	1	
Simla States (Himachal):		
Mandi	25	
Total Magnetite Ores ...	463	1,200
3. *Limonitic Spathic Ores*:		
Bengal:		
Raniganj Coalfield		500

Orissa raises about 36 p.c. of India's total iron ore. Mayurbhanj contains large deposits of high grade iron ore in three principal fields—Gurumahisani, Sulaipat and Badampahar. The most valuable deposits occur in the chain of hills extending over 30 miles from Kompilai in Bonai to the neighbourhood of Gua in the Singhbhum district as in this area about 60 per cent of the total deposits of this belt are obtained. These three fields are all high lands and are connected by railway lines with Tatanagar, the centre of steel industry. These are also within easy reach of coal and dolomite fields and raise nearly one-third of the total Indian output. Kiriburu area is being worked for iron ore with assistance from Japan, and production has already started. The reserves of iron ore in the Kiriburu area are estimated at 173 million tons. Singhbhum is the largest iron-ore-producing area in India and rich deposits of high grade haematite occur in Pansira Buru, Gua, Buda Buru and Noamundi, all in the Kalhan region. The iron contents of the ores in this area are greater than those of Mayurbhanj. The fields are connected by the branch lines of the South Eastern Railway.

Keonjhar possesses two fields—one in the Bagia Buru ridge and the other on the north-eastern part which is really a continuation of the Noamundi mine of Singhbhum. Manganese and dolomite are also raised in the neighbourhood.

Madhya Pradesh is rich in iron ores which are now being exploited for the steel plant at Bhilai. The Dalli and Rajhara hills and Bastar hold out great possibilities. Bailadila iron-ore deposits are being prospected for export and use in the steel plants of Bhilai.

In Mysore the main source of the ore supply is the Kemmangundi field in the Babubudan hills. Iron ores are also found in other places of Mysore, but they are not worked at present. Ratnagiri district in Maharashtra holds out future possibilities. The Redi area in Maharashtra will soon give an annual production of 0·5 million tons of iron ore. Recently large deposits of iron ore have been discovered in Salem and Tiruchirapalli districts in Madras. The quantity of ore has been estimated at 304 million tons at Salem-Trichinopoly. These fields can be developed for the erection of a steel plant in South India.

Iron ore reserves in India are much larger than the amount of coking coal available and, therefore, India can spare large quantities for export.

The annual iron-ore requirements for the steel plants in the public and private sectors are 111·6 lakh tons, of which Rourkela requires 17 lakh tons, Bhilai and Durgapur 19·4 lakh tons each, Mysore 2 lakh tons, Tata 32 lakh tons and Indian Iron & Steel (Burnpur) 21·8 lakh tons. The Third Plan estimates that India's domestic iron-ore requirements by 1965-66 will be 20 million tons.

Exports of iron ore from India before 1949-50 were negligible. Since 1950, however, iron ore has occupied an important place in the exports.* Iron ore is now one of the important sources of foreign exchange earnings to India. During 1960-61 India exported 31 lakh tons of iron ore, which represented the surplus to India's requirements. The entire exports of iron ore are at present canalised through the State Trading Corporation.† In 1961-62, India earned Rs. 17 crores as foreign exchange from the export of iron ore.

Of total current exports Japan alone accbunt for more than 50 p.c. and the other customers are Poland, Yugoslavia, Hungary, Italy and East Germany.

To meet the requirements of domestic industries and export target of 10 million tons, the annual production of iron ore will be raised to 32 million tons from 1965-66.

EXPORT OF IRON ORE
(Thousand tons)

	Export	P.c. of total production
1957	2,215	48
1958	1,866	33
1959	2,471	32
1960	3,100	34

* Japan is the biggest purchaser of India's iron ores. Nearly half of India's iron ore exports are shipped to Japan. China, Hong Kong, Philippines and Malaya produce iron ores at comparatively cheap rates. India has, however, the advantage of low cost of production and the high quality of the ores.

† From July 1957, the State Trading Corporation was given the sole responsibility for the export of iron ore as the Government felt that bulk contracting and bulk handling through a central agency would make India's position stronger as an exporter of iron ore.

Manganese

Manganese is used for hardening iron and steel, in the manufacture of block enamel, in the chemical industry for the manufacture of bleaching powder and in electrical and glass industries. Manganese is essentially the most important of all the ferro-alloy metals and is an absolute essential, for which there is no substitute in making carbon steel. India is the second largest manganese producer in the world, led by the U. S. S. R. "As the demand for manganese is governed by its uses in the manufacture of steel, it is subject to great vicissitudes as the heavy industries rise and fall with the calls from trade and the manufacture of munitions."

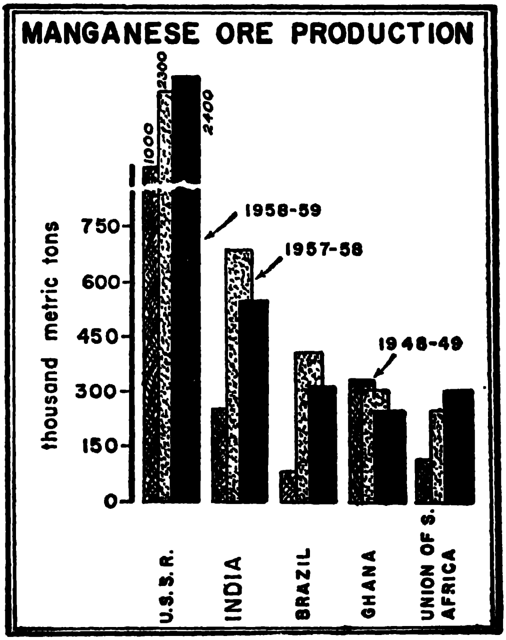


FIG. 39. The comparative figure shows that India is far behind U.S.S.R. and not much ahead of Brazil.

The reserves of manganese ore in India are by far the largest in the world. It has been estimated that of 180 million tons of reserves, about 40 p.c. are of marketable grade. A large part of the reserves is thus of poor quality.

Manganese mining in India engages nearly 80,000 workers who are mostly recruited from the adjoining districts of production. The mining operations are easily and cheaply carried out by unskilled labour due to open-cast working.

Production of manganese ore in India in 1960 was 1·6 million metric tons. Madhya Pradesh is the largest producer of manganese ore; it is found there in the Balaghat, Chindwara

and Jabalpore districts. The State raises nearly 55 p.c. of the total Indian output. The industry has received great impetus by the opening of the Vishakapatnam port, which permits easy movement of the mineral to the port by the Waltair-Raipur

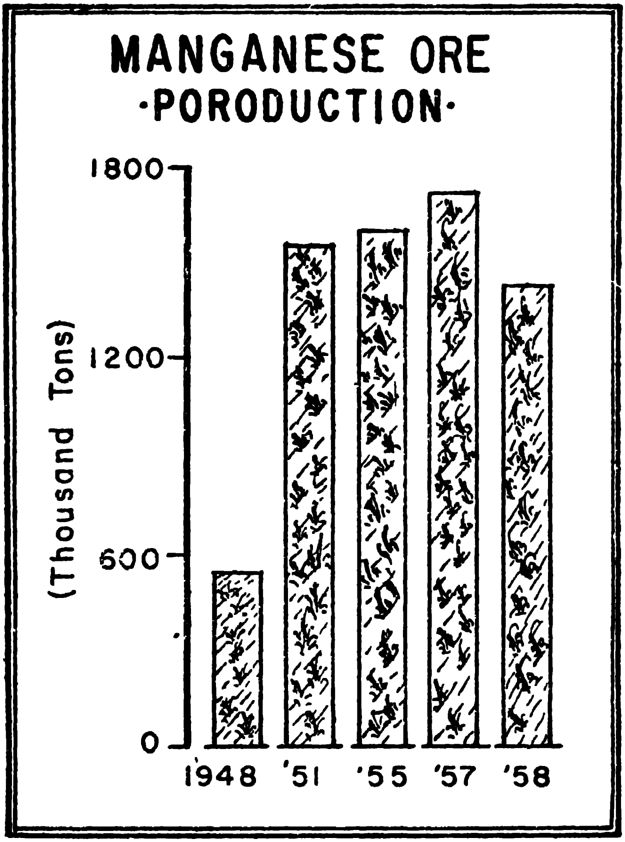


FIG. 40. Since a large percentage of manganese reserves consists of poorer grade, it is doubtful whether the production will increase in appreciable way because of high cost.

railway line. Before the opening of the port, Madhya Pradesh had to depend on Bombay or Calcutta for exporting manganese outside. It was difficult to sell outside second grade manganese ore because of the high railway freight from M.P. to Bombay and Calcutta. Now, because of the railway line it is possible for M.P. to meet a large portion of the world demand for second grade manganese ore.

The important areas of production are Orissa, Madhya Pradesh, Maharashtra, Mysore and Andhra Pradesh.

PRODUCTION OF MANGANESE ORE

('000 tons)

	1955-56	1957-58
Andhra Pradesh	112	211
Bihar	49	43
Maharashtra	417	357
Madhya Pradesh	389	405
Mysore	211	220
Orissa	401	434
All-India	1,600	1,700

In Maharashtra State large deposits of manganese ore are found in the districts of Nagpur, Bhandara and in North Kanara.

In Bihar Manganese ores are found in several parts of Chotanagpur, mainly in Kalhan and Singhbhum. A small production also comes from Chaibasa. Although most of the Bihar deposits are of no economic value today, their nearness to iron ore districts and Jamshedpur will make them important in near future. Gangpur and Keonjhar are the two important areas in Orissa for the supply of manganese. Bonai and Ganjam also produce this ore in good quantities. About 50 p.c. of the ore deposits of Orissa is low-grade. Balaghat and Chindwara in Madhya Pradesh have large deposits of manganese up to a depth of 500 ft. In Mysore, though the fields are widely distributed, the output is very small, being less than 1,000 tons, and it is raised in Chitaldrug, Kadur, Shimoga and Tamkur districts. Labour is easily available in Mysore.

Although there is a steady rise in the consumption of manganese ore by the Indian iron and steel companies, the prosperity of the industry will depend on its ability to put the mineral on the world market at competitive prices. The Indian

iron and steel companies consume hardly 300,000 tons a year out of the total production of more than one million tons.

The manganese industry therefore depends mainly on exports. In fact, manganese is a traditional item of our export trade. The principal buyers are U.S.A., Japan, U.K. and France.

EXPORT OF MANGANESE ORE

(In '000 tons)

1955	...	...	1232
1957	...	...	1715
1959	...	...	961
1960	...	...	1167

In 1961-62, India earned about Rs. 14 crores from the export of manganese ore.

The basic difficulties in regard to export that are being faced by the industry are (*a*) the competition from the Brazilian exporters, (*b*) high costs, (*c*) high rates of royalties from mining and (*d*) the absence of a suitable long-term export policy.

The U.S.A. is the biggest purchaser of manganese ore in the world, and takes nearly 50 p.c. of her total requirements from India. Ghana, the Congo, Brazil, Cuba, Egypt and South Africa are the competitors of India in the American market. In spite of the high cost of production, Brazil has the advantage of being located near the consuming centres which necessarily brings down the freight rates. In the case of India, apart from the problem of distance, the internal transport cost is comparatively high. This "coupled with the increase in the royalty rates has been mainly responsible for pricing out our manganese ore in the world market". There is urgent need for removing these difficulties so that the competitive position of India in the international market is strengthened.

The Third Plan indicates that the domestic requirements and quantum of export each year during 1961-65 will be 0·5 million tons and 1·5 million tons respectively. In view of the fact that a large part of the manganese ore reserves is poor in quality, their beneficiation has become urgent for conservation of the materials.

Copper

Copper is usually found in combination with silver, gold, iron, lead and sulphur. It is extensively used in the electrical industries as a conducting medium as well as in the telephone and telegraphic equipment, in shipbuilding, in railways and in the production of alloys. In India copper is particularly important for brass making and coinage.*

India's share in the world production of copper is very insignificant. In 1958 she raised only 411,000 tons of copper ore out of the world's total of 2·5 million tons of contents of metallic copper. The actual production of copper metal in India is about 8,000 tons as against the demand for 70,000 tons. Copper consumption in India is as yet very low compared to U.S.A., U.K. and other industrial countries. The *per capita* consumption of copper in India is 4 oz. whereas in U.S.A. it is 18 lbs. and in U.K. 16 lbs.

In India copper used to be smelted formerly in considerable quantities in Southern India (Mysore and Madras), Rajasthan and in various other places. At present it is mined on an extensive scale only in Mosabani in Bihar.

A copper-bearing belt persists for a distance of some 80 miles in Singhbhum where important fields like Mosabani, Ghatsila and Dhobani supply the major portion of the Indian output. The copper ores of Singhbhum are related to tongues of granite which intrude the schists. The ore occurs as veins in the granite and in the neighbouring mica schists, quartz schists and horneblende schists. The individual loads normally consist of one or more veins of sulphide varying in thickness from one inch to two feet, but the average is about five to seven inches. The average grade ore contains about two per cent copper. The copper mines of Singhbhum employ more than 800 persons.

Copper ore also occurs in Hazaribagh of Bihar, Khetri and Daribo in Rajasthan, Garhwal district in U.P. and Anantpur in Andhra Pradesh. It has been estimated that Khetri area alone has 28 million tons of reserves with an average copper

* Till recently the prosperity of the Indian copper industry depended largely on the brass-making industry. With the introduction of aluminium products in the markets, the demand for brass goods has fallen considerably.

content of 0·8 per cent. Along the outer Himalayas, a belt of copper-bearing rocks runs through Kulu, Kangra, Bhutan and Sikkim, which are now difficult of commercial exploitation owing to the lack of adequate communications. The national highway connecting Siliguri with Gangtok in Tibet passes by the side of the Bhotang mine. The road is accessible throughout the year, but the mine is in a deep valley where the climate is extremely cold in winter. Sikkim has about 350,000 tons of copper ore reserves with an average combined copper - lead - zinc content of 6·24 per cent.

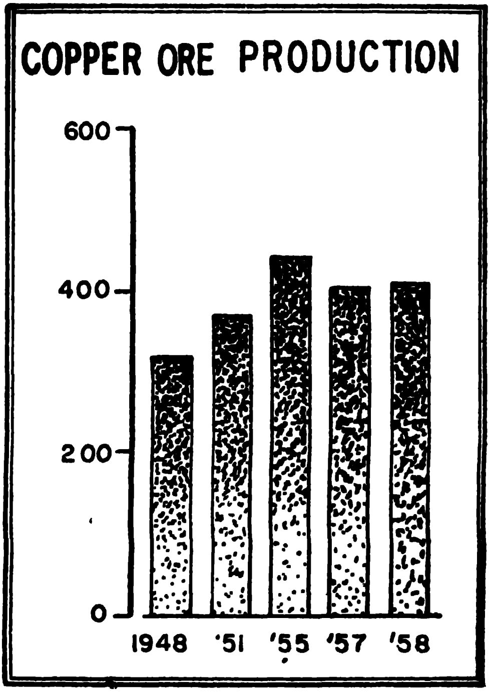


FIG. 41. The graph in thousand tons of production indicates that like other countries, there have been fluctuations of copper production in India. In 1962 the production was less than that of 1958.

COPPER ORE PRODUCTION IN INDIA

	Tons		Tons
1944	326,017	1955	353,000
1948	322,382	1956	386,196
		1958	411,492
1950	360,308	1960	404,000

India can hardly meet one-fifth of her requirements from internal supply of copper ore. The consumption is on account of electrical cable and wire industry, defence, railways and other industrial purposes. U.S.A. supplies about one-third of our

requirements, followed by U.K., Canada, Chile and Belgium. Unless the internal resources are developed, India will have to depend on foreign supply of copper.

Gold

Gold is mainly used in India for ornamental, medical and chemical purposes. The annual consumption is about 215,000 oz. In the list of minerals in India, gold occupies the fourth place in value after manganese, iron ore and salt. But India's contribution to the world's total output of gold is only 2 per cent. Gold is more widely distributed throughout India than any other useful mineral with the exception of iron ore.

In 1962 India raised 17,010 kilograms of gold.

In India gold is found in Mysore, Madras, the Punjab, U.P., Bihar and Orissa. But the chief centre of gold-mining in the Indian Republic is the Kolar gold-field which is situated in the Kolar district of Mysore State. This field produces about 99 per cent of Indian gold. The Kolar gold-field is 40 miles from Bangalore and lies on a high land 2,800 feet above sea-level *"where there is a single gold-bearing reef of quartz some four miles long"*. The field employs more than 23,000 workers. Sivasamudram, 92 miles distant, supplies electrical power to the Kolar field. There are four principal

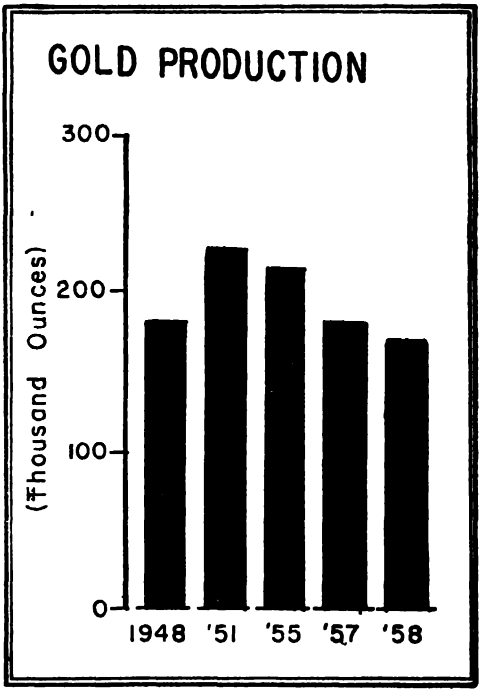


FIG. 42. The trend towards decreased production has become prominent after 1951.

mines in the Kolar field—the Champion Reef mine, the Ooregum mine, the Mysore mine and the Nundydroog mine. Champion Reef and Ooregum are among the deepest in the world, well over 9,000 feet. The labour force on the Kolar gold-fields is of a very heterogenous character. About 25·5 per cent are Mysoreans and the rest, outsiders from the West coast and Tamil districts bordering on Mysore State. About half the labour force belongs to the depressed classes. The quantity of gold produced at the Kolar fields from the commencement of operations in 1882 to the end of 1958 was about 24 million ounces. The production of the field is, however, on the decline. The Kolar gold mines have been nationalised. There are plans to extend the working of the Champion Reef mine to a depth of 11,000 feet and to explore the Mysore and Nundydroog mines to a depth of 10,000 feet.

In addition to the Kolar gold-field, some small production has been derived from the Bellara mine, 60 miles west of Bangalore, which has been re-opened by the Government of Mysore.

Not long ago the Raichur and the Dharwar districts produced a fairly large quantity but these fields have now practically been closed down. Shortly, production on a small scale can also be expected from the Hutti mine in Mysore where the equipment for the milling plant, is now in course of erection. Though Anantapur in Andhra Pradesh contains several large quartz reefs, it does not at present produce any gold. Gold deposits have been found in certain parts of Salem and Chittur districts of the Madras State.

Alluvial gold is found with sands in many rivers of India. It is recovered by the local inhabitants. Such areas are Singhbhum in Orissa; Ambala district in the Punjab; Bijnor district in U.P., and the Brahmaputra valley in Assam.

Mica

India is the largest mica-producing country in the world and produces more than three-quarters of the world's production.

Mica has been used in medicinal preparations and for decorative and ornamental purposes since early times in India. Today, it is one of the chief strategic minerals and is indispensable in the electrical industry. "The development of

Wireless Telegraphy and Radio communication, Aeronautical Engineering and Motor Transport would have been impossible without it." Mica is also used as stove fronts, lamp chimneys, protective spectacles as well as in fire-proof points, patent roofing materials and as a decorative medium for fancy papers and ornamental tiles.

There is at present an enormous waste in the trimming and dressing of the crude mica. About 70 to 80 per cent of the crude mica is dumped as unmarketable refuse in the Hazaribagh and Nellore mines. This waste mica is imported by the U.S.A. where it is turned to fine powder for various uses in electrical insulation.

The industry gives employment to about 32,000 persons. The aboriginal women and children who are generally employed in mica mines carry out the work with great skill.

Although mica is widely distributed, two principal areas control its production and trade. These are (*i*) the Bihar belt, a strip of country some fourteen miles broad and over 60 miles long, running obliquely across the districts of Hazaribagh, Gaya, Monghyr and Manbhum, and (*ii*) the Nellore district of Andhra Pradesh.

PRODUCTION OF CRUDE MICA

(in cwts.)

	1955-56	1956-57
Andhra Pradesh	96,106	109,588
Bihar	241,433	292,923
Madras	6,001	5,237
Rajasthan	121,374	152,887
All Total	465,014	560,685

In 1960, the production was a little more than 600,000 cwt.

The areas of production are Bihar (Gaya, Hazaribagh, Monghyr, Manbhum), Andhra (Nellore), Madras (Nilgiris), Kerala, and Rajasthan (Ajmere and Jaipur). Bihar may be regarded as the world's trustee for this mineral. The Bihar belt supplies more than 80 per cent of the Indian output. Bihar mica is mainly of the ruby variety, the higher qualities of which,

known as *clear and slightly stained,* are the finest in quality in the world and are greatly used in certain electrical industries. The Bihar belt is about 80 miles long and the deposits are spread over an area of 1500 square miles. It runs in a general east-west direction along Gaya, Hazaribagh and Monghyr districts.

The Nellore district of the Andhra State raises mica by open quarrying at Gudur, Kavali, Atmakur and Rajpur. The fields are in the coastal plain and extend for about 60 miles. The Nellore mica has a greenish colour and is inferior to Bihar Mica.

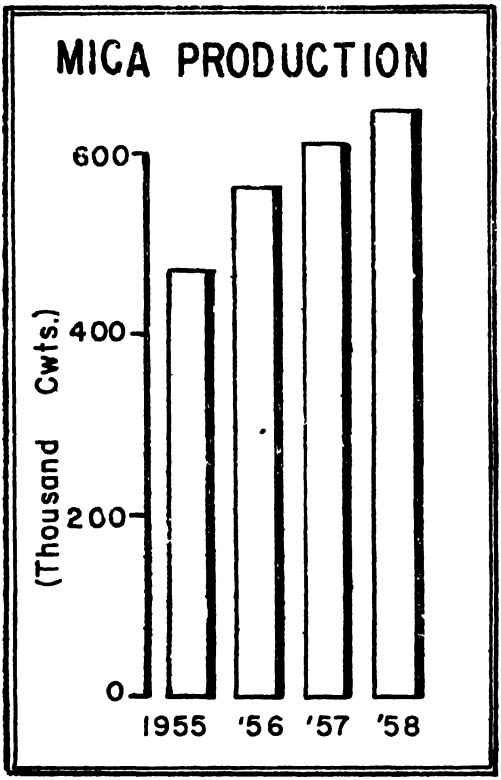


FIG. 43. The statistics of mica production were not reliable till 1955. In 1960, the production was a little more than that of 1958.

Rajasthan which raises more than 25 p.c. of India's production sends its mica to Bihar for splitting and marketing.

The mineral is raised mainly for export because the internal consumption of mica in India is very small. The need to start an industry to manufacture finished products from raw mica arises out of the efforts being planned by importing countries to produce substitutes for mica. The industry can be placed on a firm footing by an organised effort to establish the electrical industry in the country. A new micanite factory is being set up in Jhumri, Telaiya. The Government also proposes to undertake the manufacture of micanite at Bhopal.

India earns about Rs. 10 crores a year from the export of mica. The principal buyers of Indian mica are the U.S.A., the United Kingdom, Western Germany and France. In 1960, India exported 28 million kilograms of mica in the form of blocks and splittings in almost equal proportion. The U.S.A. takes about 50 per cent of the exports. The indigenous consumption of mica in India is so low that the industry has to depend entirely on foreign markets for its prosperity. In addition to developing electrical equipment plants so as to use a part of the indigenous production of mica in the country, micanite factories and mica grinding mills may be started so that India may be able to export finished products abroad.

The exports mainly go through Calcutta, Madras and Bombay. Calcutta alone handles 85 p.c. of exports while Madras and Bombay handle 14 p.c. and 1 p.c. respectively.

The imports of mica into U.K. from Canada and Brazil have recently affected the Indian trade. Today Brazil is not only developing as a competitor to India in international mica markets, but has also been seeking to process her mica in India.

Moreover, synthetic mica, of which the well-known products are Pertinax, Bakelite, Paxolin and Formalite are competing with natural mica.

The future of the mica industry is bright. The advance of science has not yet been able to affect the importance of mica. If the cost of mica can be kept at a reasonable level, its demand will continue to increase. Mica Export Promotion Council which was set up in 1956 has been concerned with the study of the problems of Mica industry and its trade.

Salt

In India salt is mainly obtained from three sources—(*i*) from sea-water, (*ii*) from inland lakes and sub-soil water, (*iii*) from beds of rock salt. The chief salt-producing areas are Maharashtra, Madras, Kerala, Andhra, and Rajasthan. More than two-thirds of the total production come from the sea-water of Gujarat, Maharashtra, and Madras coasts. The West coast salt works include Rann of Cutch, Kathiawar and the coast from Surat to Mangalore. Dharsana and Chharvad on the east

of the Gulf of Cambay and Okha manufacture salt in large quantities. Normally the manufacturing season is from January to June. A considerable quantity of salt also comes from the brine of wells on the Little Rann of Cutch. The saline content of the water is very high; and the salt is produced by solar evaporation.

The salt-producing districts of the south-eastern coast of India extend from Ganjam to Tuticorin in the extreme south. Salt is also manufactured in the Udipi in Mysore. Madras contributes more than 20 per cent of India's total production. The average production is about 130 lakh maunds of salt. About 85 per cent of the production is consumed in the home State; the balance goes to Orissa, M.P., West Bengal and Mysore.

In West Bengal a few small-scale factories and cottage workers in the coastal districts produce salt from sea-water. The workers also produce salt by the artificial lixiviation process within scheduled areas of the coastal districts. Most of Bengal's requirements are met from the west coast of India and Madras. Salt production in West Bengal can be increased by the establishment of large factories along the Sundarbans. On the Contai sea-board of Midnapore the manufacture of salt by the method of solar evaporation is possible.

Another important source of salt is the sub-soil and lake brines of Rajasthan where there are many lakes. The Sambar Lake, the largest of all, covers an area of 90 square miles and produces about 7 million tons every year. The reason for the high percentage of salt is that during the summer the south-western winds carry particles of salt from the Rann of Cutch and deposit them in this region, which are again washed into the lakes with rain water. Sambar is the biggest and the most ancient salt-field in India. In 1960 Sambar raised about 7·5 million maunds of salt. At present only 60 p.c. of salt can be recovered from the available brine at Sambar field. The Didwania field produced a little more than 8 lakh maunds of salt in 1958.* Rajasthan Salt is mainly distributed to Punjab, Delhi, U. P. and Madhya Pradesh.

* The Sambar and the Didwania salt works are managed by Hindustan Salt Company which is a State enterprise. The company is also responsible for the production of salt at Kharaghoda in Bombay.

At the end of the third Five Year Plan, the annual production of salt in India will increase to 150 million maunds as against 100 million maunds in 1960.

In India there is very little demand for salt for industrial purposes. About four-fifths of the requirements are for house-

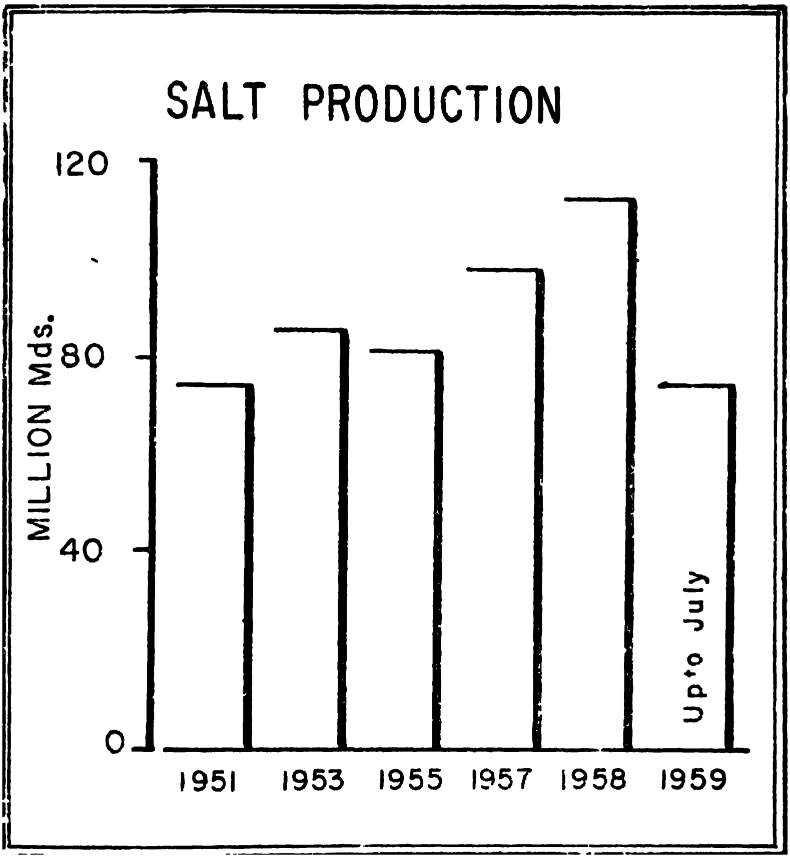


FIG. 44

hold uses. In the U.S.A., however, three-fourths of the requirements are for industries. The demand for salt in India, therefore, is likely to increase a good deal with the advancement of the country and development of its industries. Salt is associated with certain chemical and other physical impurities, which, unless removed, render the industrial uses of salt restricted in India.

In India rock salt is available only in Himachal Pradesh. The Geological Survey of India has started a detailed survey of the rock salt deposit at Mandi to estimate the salt reserves and to determine the quality of salt that can be mined economically in this site.

India attained self-sufficiency in salt in 1950, and export started from 1952. In 1961, India exported 399,000 tons of salt. Japan, Indonesia and Nepal are the principal importers of Indian salt.

Saltpetre. Saltpetre has great industrial demand. It is used in the manufacture of glass, for food preservation and for manurial purposes in addition to its importance as a constituent of gun-powder. Bihar and Uttar Pradesh are the important producers. The main centre of manufacture is Farrukhabad in U.P. Nearly the whole of the output is exported but a small portion is retained in the country for the Assam tea-gardens. Saltpetre is exported to the U.S.A., China, the U.K., Mauritius, Ceylon and Straits Settlements.

Silver is obtained native and in combination with other metals, the chief of which are gold, lead and copper. Silver is used in India for the manufacture of ornaments, table utensils and coinage. India is by far the greatest consumer of silver in the world.

Silver is obtained from the Kolar gold-field in Mysore and Manbhum in Bihar. Anantapur in Andhra Pradesh, once an important supplier, does not raise it any longer.

India is just self-sufficient in silver. A small quantity is however imported from U.K., Belgium and Western Germany.

Chromite has considerable demand in the manufacture of ferro-chrome, chromite steel and chromite bricks. This is also the source of chromium salt necessary for tanning and dyeing. The reserves of chromite have been estimated at 2·3 million tons. India produces about 85,000 tons of chromite a year. In 1960, the production was 99,000 tons.

Mysore is the principal supplier of chromite and contributes nearly 35 per cent of the Indian output. Shimoga and Hassan are the two main fields of Mysore where production is on the increase every year. The next important supplier is the Singhbhum district in Bihar which raises nearly 12 p.c. of India's

total ore. The other areas where chromite occurs are Ranchi and Bhagalpur districts in Bihar.

Practically the whole output is exported outside. The principal purchasers are the U.K., Norway, Sweden, Germany and U.S.A. The shipment goes through Madras and Calcutta.

Indian chromite has its rival in the European markets in the product of Rhodesia and New Caledonia.

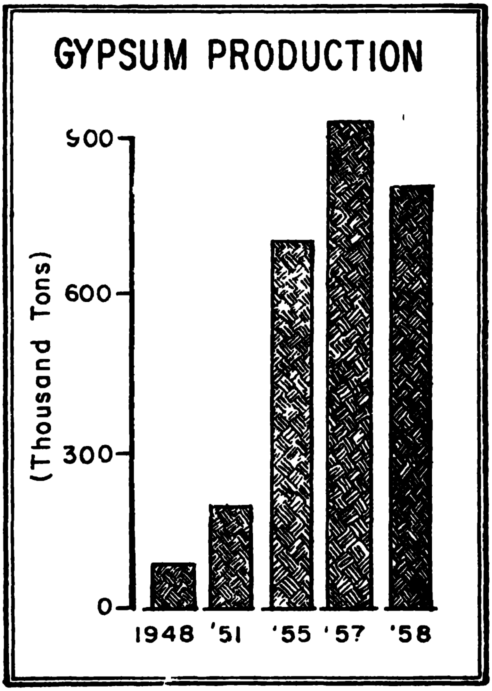


FIG. 45. The entire annual production is consumed in the country for the manufacture of fertilisers, cement and plaster of paris.

Antimony is a useful alloy for mixing with softer metals. Although India does not at present produce much antimony, the future possibilities for the development of this industry are great. Antimony ore deposits are found in Lahaul and Kangra districts. A considerable quantity may also be obtained from the Chitaldrug district in Mysore. At present about 500 tons of metal are produced by India from the imported ores which mainly come from U.K., Czechoslovakia, Iran, and Australia.

Tungsten or *wolfram* is used in the manufacture of hard steel and in the form of wire in electric bulbs. This metal ore occurs in Singhbhum in Bihar, the Marwar district of Rajasthan and in M.P., but these deposits are small in quantity. The annual consumption is probably in the neighbourhood of not more than 50 tons.

Gypsum is necessary for making fertilisers and in the making

of certain kinds of paper. It is also used in India in considerable quantities in the cement industry. It can also be used as a source of sulphuric acid. It is found in Rajasthan, Punjab, Kashmir, Madras and Kathiawar.

By far the most important producer is Rajasthan where the mineral is found in Bikanir, Jodhpur and Jaisalmer. Rajasthan raises nearly 80 per cent of the Indian output. In Madras the gypsum deposits occur near Tiruchirapalli.

The annual production of gypsum from all deposits in the Indian Union amounted in 1960 to about 980,000 tons.

Graphite is used for manufacture of stove-grate polishes and paints, as a lubricating agent for certain types of machinery and in making lead pencils. Up till now this mineral has not been commercially exploited to any great extent although its deposits exist in Kerala, Godavari district, Vishakhapatnam, Orissa, M.P. and Ajmer-Marwara. The present production is 1,500 tons, as against the current consumption of 2,500 tons annually.

Asbestos is a silky fibrous mineral found usually in veins. It is used mainly in the manufacture of fire-resisting materials. India raises a very small quantity of asbestos from the Bangalore district of Mysore, Ajmer-Marwara in Rajasthan, and Cuddapah district of Madras. India has to import every year large quantities of asbestos goods. There are, however, great prospects for an asbestos industry in India as the reserves are about 580,000 tons. The present production is only 1,683 tons compared to 30,000 tons needed for internal consumption.

Diamond. Although the Indian diamond industry is the oldest in the world, its present output is insignificant.

Diamond occurs in the Anantapur, Bellary, Kistna, Guntur and Godavari districts of the south; Sambalpur district in Orissa; Chanda district in Maharashtra; and in Madhya Pradesh.

QUESTIONS

1. Give an account of the mineral resources in India and the extent to which they are utilised. (Agra B.Com. 1952; Rajasthan M.Com. 1956)

2. Explain what is meant by essential, strategic and scarce minerals. How is India equipped with each of these classes of minerals?
(Patna M.A. 1956; Delhi B.Com. 1960)

3. Describe the principal coal-fields of India. "The concentration of coal-fields in one part of India is mainly responsible for the present location of industries in India." Do you agree? Give reasons.

(Delhi B.A. Hons 1950; Rajputana M.Com. 1955)

4. Discuss the position of mineral resources in India for the development of non-ferrous metal industries.

5. On a sketch map of India show the regions where iron, manganese and mica are found. Which of the minerals are mined for home consumption? Name the countries of the world that compete with India in manganese for export markets.

6. Examine the iron resources of India. Show how far these are located near the coal-bearing areas in India.

(Cal. B.Com. 1953; Delhi B.Com. 1955)

7. What are the principal minerals of India? Which of these are mostly raised for foreign markets? Does India need any policy of conservation for minerals? (Rajasthan B.Com. 1961)

CHAPTER XI

POWER SUPPLY IN INDIA

One of the most valuable assets in any country, and one which has a very direct bearing on its economic development, is a natural source of energy, from which electricity can be generated. The existence of an abundant source of energy has undoubtedly a most potent influence on material development. The sources of power in any country may be *irreplaceable* or *replaceable*. In India the irreplaceable sources are coal, oil and materials for nuclear power like uranium and thorium, while the replaceable sources are water power, wood, wind power and solar radiation. The principal sources of power, now used in India, are coal, wood fuel, oil and water. Tidal power, wind power, geothermal power and solar radiations have not made much impact on electricity development in India so far.

ENERGY PATTERN OF INDIA (Million tons of Crude equivalent)

Sources	1955	1958
Coal	24·40	28·57
Oil	3·60	5·71
Hydel	1·40	2·85
	28·40	37·13

The present pattern of commercial energy consumption is mainly dependent on coal. During the last few years, however, the relative importance of other sources like oil and hydel has been on the increase.

The annual per capita generation in India is only 39 Kwh compared to Norway's 7,740 Kwh, Canada's 5,780 Kwh, U.K.'s 1,910 Kwh, Japan's 815 Kwh and Turkey's 60 Kwh. This indicates that in the scale of power utilization, the position of India is very low. In 1956, the energy generated was 966 crore Kwh,

which increased to 2,619 crore Kwh in 1959. The principal power schemes completed and brought into service are Nangal (Punjab), Bokaro (Bihar), Chola (Bombay), Khaperkheda (M.P.), Moyar (Madras), Sarda (U.P.), Sengerlam (Kerala) and Jog (Mysore). With growing emphasis on industrialisation and large-scale development of basic industries, the pattern of utilization of power by different consumer groups indicates a gradual change.

PATTERN OF UTILIZATION OF POWER IN INDIA

	1951 P.c. of total power	1955 P.c. of total power	1960-61 P.c. of total power
Domestic	7·9	7·9	7·5
Commercial	4·4	4·8	4·4
Public lighting	1·5	1·6	1·5
Industrial	61·4	62·6	62·0
Traction	4·4	3·7	2·3
Irrigation	2·7	2·4	4·2
Water works	2·8	2·6	2·3
Total generation (million kwh)	7,514	10,777	19,850

In spite of the development of power resources in India, the shortage is still felt in several States including U.P., Madras, Bihar, Bengal, Punjab, Andhra Pradesh and Mysore in view of the increasing demand from industries.

Though coal and hydro resources of the country are adequate for meeting the power requirements for quite a number of decades, there are areas where either better grade coal or hydro resources are not available. There is no shortage of coal in the country, and the problem is mainly in regard to movement of coal and in raising coal. Extensive use of inferior grades of coal where they are available will stop avoidable movement of better grade coal from distant mines. In western and southern regions, the use of inferior coal for power generation will be of great value to industries. Indian forests are generally confined to hilly tracts from where transport is difficult and expensive. Nevertheless, the planned utilization of wood as fuel can assist in the

improvement of certain areas. The production of petroleum in India is inadequate and, therefore, unless new fields are found, it cannot provide power on a large scale. There are oil refineries at Digboi and Gauhati in Assam, Barauni in Bihar, Cambay in Gujarat, Vishakhapatnam in Andhra, and in Bombay. India has an abundance of sunshine, and if means can be devised to capture the energy provided by solar radiation, the problem of power supply at least during the daytime can be solved. The utilization of solar power in India for specific purposes like water heating, cooking, etc., is possible. However, solar radiation as a source of power will take time to come into operation because of technical and economic factors. Wind power is inexhaustible and can be used where it is available in adequate velocity and frequency. It does not involve any problem of production and transportation. Although wind power can be made available in the coastal regions of India, the chief difficulties are that it cannot be depended upon with certainty to produce power at any particular time, and that wind-driven machines must be relatively large for a given power capacity because of the low density of the air. Consequently, wind-power as a source of energy in India can be local in scope but not very effective. But in arid regions having no alternative source of power supply, the wind mills can be of great use even if they can function effectively only during a part of the year. Thus there is a considerable scope for wind mill plants in parts of Gujarat and Rajasthan where the wind velocity is comparatively high.* In the near future India is likely to use nuclear power for generating electricity. The country has sufficient resources of uranium and thorium to develop this new source of energy.

Also, India has inexhaustive resources for the manufacture of synthetic fuel oils from sugar-cane and oil-seeds. The sugar factories of India throw away every year nearly a quarter million tons of molasses which could be very well utilized for the production of alcohol. When mixed with petroleum, this alcohol becomes an excellent fuel power for automobiles. In 1948 the Government of India passed an Act for the development of the power alcohol industry under the control of the Central Govern-

* Professor E. W. Golding of the British Electric Research Association who came to India in 1954 reported that the prospects for the use of wind power in India were considerable.

ment and prescribed, *inter alia*, the admixture of power alcohol in a proportion of not more than 25 p.c. The production of power alcohol is at present at the rate of 36 million gallons a year and comes from U.P. and Bihar. A new plant has been erected at Nasik in Maharashtra State which will give 1 million gallons of power alcohol a year. In the near future the production is likely to go up to 47 million gallons. It is also possible to utilize vegetable-oil contents for the preparation of fuel oil.

As at present visualised, the power development in India will have to be dependent mostly on coal and hydro-electricity.

The pattern of power utilization in India is as follows:—

Andhra, Orissa	Mainly thermal
Madhya Pradesh	"
South India	Largely hydro-electric
Maharashtra	"
Bihar & Bengal	Mainly thermal
Punjab & U.P.	Mainly hydro-electric

Coal. In India coal is the most important mineral product in respect of value and quantity. India is the second largest coal-producing country in the Commonwealth and occupies the eighth place in the world.

India's coal industry suffers from a number of drawbacks. Indian coal is generally poor in quality: its fuel properties, that is, the percentage and condition of carbon content, are definitely lower than those of European or American coal. With the exception of Jharia coal, Indian coals have usually a high proportion of moisture. Again, the coalfields are very unevenly distributed. More than 98 per cent of the total output comes from one big belt—the Lower Gondwana coalfields (West Bengal, Bihar, Orissa, and Madhya Pradesh). The Peninsular India is very deficient in coal deposits and coal is totally absent in U.P. The transhipment of coal entails great difficulties in view of its bulk. Hence it can be easily realised how expensive coal becomes as a source of motive power in industries in India, where coal must needs be carried over long distances. There is another consideration. It is not desirable to depend entirely on coal power as it is a diminishing asset and gets con-

sumed in the process of power generation. It is necessary to conserve coal for purposes that require and must use thermal

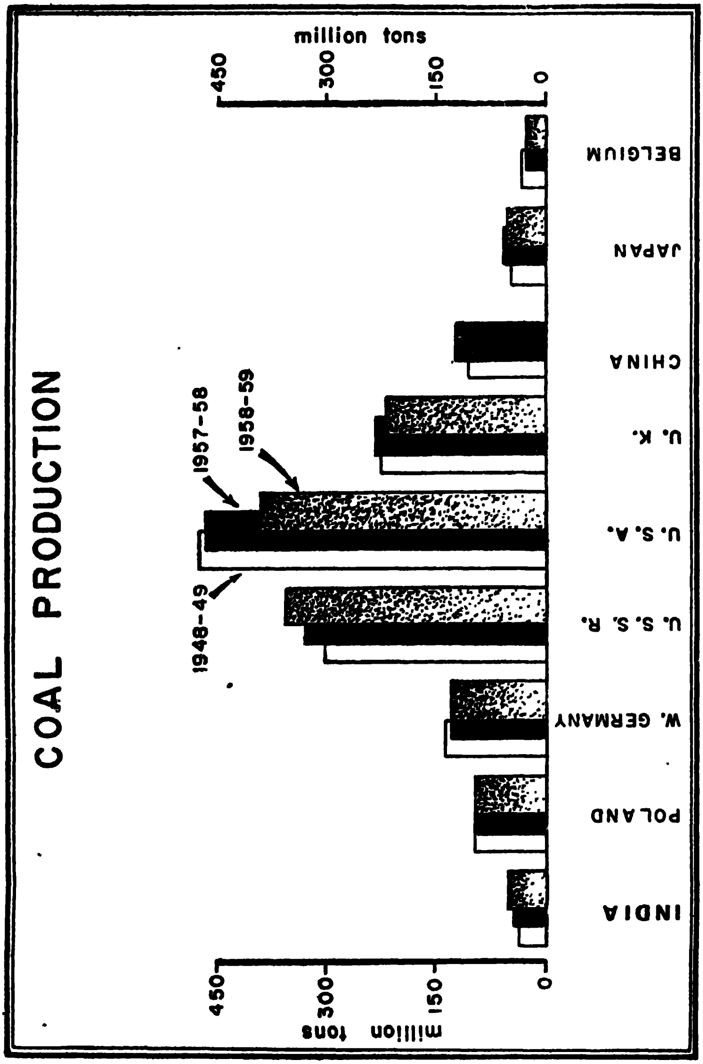


Fig. 46. Coal production in India and the world

power. Coal is also one of the important raw materials for synthetic chemical industries.

The coalfields are not situated either near the coast or in the valleys of navigable rivers. In the United Kingdom, the

coalfields are all found within easy reach of the sea-coast; in Germany the fields are found along the basins of the big navigable rivers. This distance of coalfields from the sea and from navigable rivers compels the Indian coal industry to look to railways for the movement of its products and consequently the freight is high.

Coal reserves in the Indian Union of different varieties up to one foot thickness of seams and within 1,000 ft. are 60,000 million tons which are mostly found in the Gondwana Basin. The total workable coal is estimated to be 20,000 million tons.

TOTAL COAL RESERVES

1.	Darjeeling and Eastern Himalayas ...	100
2.	Giridih, Deoghar	250
3.	Raniganj, Jharia	25,650
4.	Sone Valley	10,000
5.	Chattisgarh and Mahanadi	5,000
6.	Satpura Region	1,000
7.	Wardha Valley	18,000
		60,000

Of these reserves good quality coal is only 5,000 million tons. Whereas the reserves of non-coking coal in India are quite adequate for the country's requirements, the position with regard to coking coal is not satisfactory.* It is estimated that out of 5,000 million tons of good quality coal, coking coal amounts to 1,500 million tons. This coking coal is exclusively confined to Jharia, Raniganj, Bokaro, and Giridih. The reserves of good quality non-coking coal in the Indian Union are thus very small compared with those of U.S.A., U.S.S.R., England and Germany. At the present rate of increasing consumption the reserves may not last even 100 years.

* In 1952, it was reported by the Production Minister, Government of India that at the current rate of output, the known reserves of metallurgical coal would last only for 80 years if no measures were taken to conserve them and if no new reserves were discovered. Nevertheless, developments in washing and blendings of Indian coals for coking purposes may result in extending the period to well over 150 years.

From the point of view of utilization, the Indian coal can be divided into five groups:

(1) Coal suitable for metallurgical purposes: Such coal is found in Jharia, Raniganj, Bokaro and Giridih.
(2) High grade steam coal (both high volatile and low volatile); the sources are in Raniganj, Bokaro, Karanpura, Talcher and Singareni fields.
(3) Tertiary coal: Assam and Punjab.
(4) Low grade steam coal.
(5) Lignites: Bikanir in Rajasthan and South Arcot in Madras.

Geologically, the coalfields of India may be divided into two classes: (*a*) the Gondwana system of strata extending from Bengal, Bihar, and Orissa including Madhya Pradesh, and (*b*) the Tertiary beds found in Assam and Rasjasthan.

The Garo Hills in Assam contain large deposits of very high grade coal. The Central Government decided to undertake

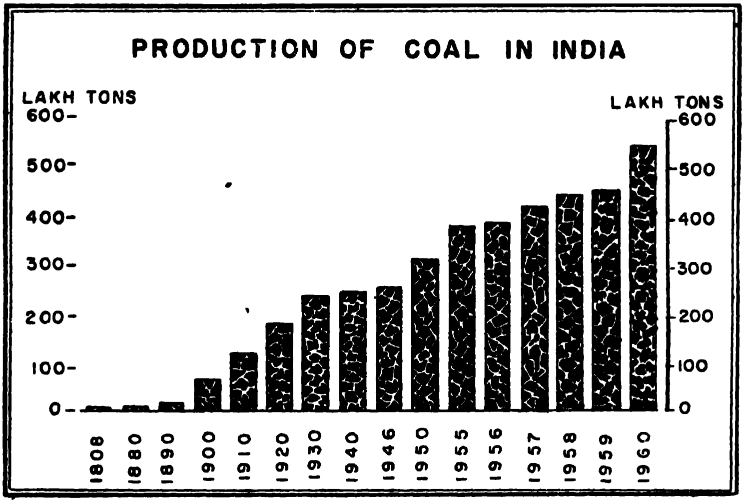


FIG. 47. Note the phenomenal progress in coal production after 1950

prospecting the area directly. The coal in these fields may rank among the best in the world. These fields when developed will make Assam self-sufficient in coal, thereby releasing a large quantity for export. New coalfields have been discovered in Rewa, Pathakera, Koba and Bihar (Hutar). Investigations have

revealed the existence of lignites in the Palana area in Bikanir division of Rajasthan. Recently the Geological Department has also discovered lignite deposits in South Arcot districts, covering an area of 16 square miles with 32 feet in thickness. This is perhaps the longest "find" in India. It has yet to be tested to what use this lignite could be put—whether for locomotives, or for extracting gas or synthetic petroleum. Recently, new coal deposits have been discovered by mining experts in the Daup area of the Nepal Tarai (the western districts of Khajawli and Soharatgarh). It is understood that the coal is high grade and it will not only meet the needs of Nepal and the adjoining Indian State of the U.P. but also could be exported to other areas if transport facilities are available. Digging operations have started with the help of the U.P. Government, and 40-mile-long railway line is under construction from Basti, in the U.P., to the coalfields area.

Commercial exploitation of coal in India started in 1773 in the Sitarampur area of the Raniganj coalfield. Lack of transport facilities delayed developments for many years, until the East Indian Railway took the track as far as Raniganj in 1885. Rapid development followed, and the output of coal steadily increased.

In 1959 the production of coal was 47 million tons of which the private sector contributed as much as 38 million tons. The National Coal Development Corporation which was set up in 1956 to look after the production of coal in the public sector raised 8 million tons in 1959. In 1960-61, the coal production was 55 million tons.

COAL PRODUCTION

(in million tons)

1951	34·43
1955	38·23
1956-57	40·30
1959-60	47·82
1960-61	54·62

The output at the end of the Third Five Year Plan is likely to be 100 million tons of which about 73 million tons will come

from Bengal and Bihar coalfields. There are at present 828 coal mines in India.

THE COALFIELDS IN INDIA: GONDOWANA BELT

Area		*Fields*
West Bengal	...	Raniganj, Darjeeling.
Bihar ...	...	Jharia, Bokaro, Giridih, Rajmahal Hills, Palamau (Aurunga, Hutar and Daltanganj),
Orissa ...	...	Talcher, Rampur (partly in the Sambalpur district and partly in Raigarh in M.P.), Ramgarh, North and South Karanpura.
Madhya Pradesh & Maharashtra	...	Umaria, Sohagpur, Singrauli. Mohpani, Shahpur, Panch Valley, Waroro, Yeotmal, Ballalpur (also known as Sastri field. It lies partly in Andhra.)
Andhra	...	Sasti, Tendur and Singareni.

TERTIARY BELT

Rajasthan	...	Bikanir.
Assam	...	Nazira, Makum.

FIELD-WISE DISTRIBUTION in 1960-61

(in million tons)

Raniganj ...	18·08	Singareni ...	2·52
Jharia ...	16·09	Orissa ...	0·88
Karanpura ...	4·48	Assam ...	0·68
Bokaro ...	3·75	Korba ...	0·57
Central region Coalfields ...	3·67	Giridih ...	0·47
Chhindwara and Chanda ...	3·06	Total ...	54·62

Raniganj, the earliest coalfield to be worked in India, covers an area of 600 square miles. It contributes about one-third of the total coal production in India. The Raniganj mines are the deepest in India and seams occur up to a depth of more than 2,000 ft. The Eastern Ry. with its branch lines serves the field. The coal production of Raniganj field in 1961 was over 18 million tons.

The Jharia field, 140 miles north-west of Calcutta, covers an area of 175 square miles. It is 16 miles west of Raniganj.

More than 50 per cent of the Indian output comes from Jharia. Seams occur up to a depth of two thousand feet. The Eastern Railway serves the Jharia field. The abundance, accessibility and high quality of this coal-bed have made the Jharia field the most important in India. It supplies coal used in the industrial areas of the Ganga valley from Delhi to Calcutta. Jharia raises 16 million tons of coal a year

Close to the Jharia field to the west is the Bokaro field with an area of 220 square miles. The North Karanpura field is very extensive and covers an area of more than 450 square miles. Though it is not important to-day, yet in future it may become a great supplier of coal. North and South Karanpura raises more than 4 million tons of coal. The Bokaro field raises about 3·8 million tons of coal. The Giridih coalfield is a small one, but it yields some of the best coal to be found in India which is largely used in metallurgical Industry.

In Madhya Pradesh, there are three fields—one in Sohagpur in Rewa, the second in the Pench valley of the Satpura region and the third in Umaria, near Katni. Sohagpur has an area of 1,200 square miles and raises nearly 1 million tons annually. Recently a new coalfield has been located in the Korba area in Madhya Pradesh. The field is stated to cover about 200 square miles divided into two sections each containing about 6 million tons of first grade coal per square mile. In future, the railways may also be served with non-coking coal from Korba coalfields to the relief of Bokaro fields. The Korba coalfield is being worked by the Government, and its production was only 570,000 tons as against the anticipated output of 4 million tons in 1961.

Maharashtra has now a number of fields in the Wardha valley, the centre being Ballalpur.

In Andhra, the principal coalfield lies in Singareni, 146 miles from Hyderabad city. "The coal itself is a dull, hard, non-coking, steam coal largely consumed by railways and mills in Southern India." Singareni field raises about 3 million tons of coal a year.

Tertiary coalfields are worked in Assam and Rajasthan, and they supply nearly 2 p.c. of India's total output. Assam raises a little more than half a million tons of the tertiary coal from Nazira and Makum. Makum contains coal of excellent quality which is largely consumed by the railways, steamer com-

panies and tea-factories in Assam. Rajasthan coalfields are located in Bikaner.

Coal is used in India for the production of electrical power, for the running of railways, for propulsion of ships, for running other industries with steam power, for smelting purposes, for such industries as glass, cement, etc. and for domestic purposes. A small quantity is used for conversion to gaseous fuel.

Railways, iron and steel and brass foundries consume more than half of the total available coal in India. Domestic consumption is as yet small although intensive propaganda is being carried on for the popularisation of soft coke as a domestic fuel.

At the present time, the demand for good quality non-coking coal is to the extent of 40 million tons. To this must be added the quantity of coking coal, now used for Iron and Steel Industry. The present demand for coking coal is a little above 14 million tons.

CONSUMPTION OF COAL IN INDIA: 1956

(In million tons)

Railway ...	... 13	Brick burning	.. 1·7
Domestic ...	.. 3	Chemicals ...	... 0·6
Electricity ...	... 3	Fertilizer plants	.. 0·7
Collieries ...	... 2·5	Paper mills	... 0·6
Cement factories	... 2	Jute mills	... 0·5
Textile and Woollen mills ...	.. 2	Glass, Pottery	... 0·6
Bunker and export	... 2	Miscellaneous	... 2·6
Minor Industries	... 0·6	Iron and Steel (Coking Coal)	.. 3·3
			39

Between 1956 and 1962, the consumption of coal has increased by more than 11 million tons, because of its greater demand for iron and steel, electricity, chemicals and fertilisers.

The Railways consume about one-third of the good quality non-coking coal produced in India. Since the reserves of non-coking coal are limited, the railways are likely to use in future the low grade coal as well as the thermal power from low grade coal. Steps are being taken to use electricity by railways in

the suburban sections of West Bengal. Then again, there are many industries (other than cement, glass and ceramics) which make use of good quality coking coal though it is not necessary for them to do so. Some restriction on the use of such coal by industries is imperative.

The coal industry of India gives employment to more than 400,000 people who are mostly recruited from Chotanagpur, Madhya Pradesh and Bihar. Many of these labourers do not work in the mines throughout the year. In the agricultural seasons, particularly in the harvesting periods, they go back to their respective villages. This problem of periodical shortage of labour in the coalfields has been solved to a certain extent by the use of electricity in the mines for pumping and coal-cutting.

Out of 828 coal mines in India, as many as 651 mines are so small that they cannot introduce mechanisation for coal cutting. Unless the smaller units amalgamate, mechanisation will not be possible. As a result the output of coal per man per shift is comparatively low in India.

In spite of the large production of coal, many areas cannot get coal in time or in sufficient quantities because of transport bottleneck. Throughout the history of the coal industry its production capacity has been governed by transport availability. There is, therefore, urgent need for doubling of railway lines over certain section and increasing the average daily supply of wagons to facilitate the movement of coal. On account of the inability of the railways to cope with the increasing volume of production, the coal industry often curtails its raisings by 3 to 4 lakh tons every month to prevent the accumulation of stock at the pitheads.

	Average daily loading of wagons (1960)	Demand for Wagons (1960)
Bengal & Bihar ...	4,336	5,167
Korba & Rewà ...	435	500
Pench & Chanda	373	420
Singareni ...	276	330
Talcher ...	40	42
Assam ...	55	55
Total ...	5,515	6,514

In addition to serious transport bottleneck and irregular wagon supply, the inadequate supply of power is also affecting production. The establishment of washeries is another urgent need of the coal industry. Many million tons of impurities move with coal, which, if washed, would reduce the burden of transport.

The progress of coal production means progress of many other industries. "As such, if there is a shortfall in coal production, it is bound to have a chain of reaction in other sphere of industries."

Though the current production is not sufficient for export, Indian coal has demand in Pakistan, Ceylon, Burma and Singapore. In 1960-61, India exported, 1·1 million tons of coal and earned a little more than Rs. 3 crores as foreign exchange.

The use of coal directly as a power is wasteful and uneconomic and can be avoided by converting coal into electricity. Besides, its conversion into electricity will permit the utilization of a number of by-products. "By electrification two-thirds of fuel consumed in industry and four-fifths consumed in colliery furnaces can be saved." Then, there is the problem of slack coal in India. Coal gets broken during mining operations. Thus a large part of coal in India is less than one inch in diameter. There is no market for this slack coal. Attempts are being made at *briquetting* the slack coal.

In future, lignite may greatly influence the location of industries. Although, it is a soft, low-grade coal, lignite can become an important source of raw material by transforming it into high grade temperature coke for metallurgical purposes as has been done in East Germany.

"'The acute shortage of electric power and fuel including domestic fuel in the Madras region, and the need for firming up the undependable hydroelectric power by thermal power, using preferably a fuel other than coal, on account of the cost and difficulties inherent in the transport of coal from the collieries in the north, compelled the Government of Madras to investigate alternative sources of fuel." As a result of the investigations, the reserves of lignite in and around Neyvali in the South Arcot district are estimated at 2,000 million tons. An integrated project has been undertaken for mining 3·5 million tons of lignite per annum and its processing and utilisation, for the generation

of 250 kw of electric power, the production of 152,000 tons of Urea per annum and the briquetting and carbonising of the remaining output of lignite to produce 380,000 tons of carbonised briquettee.

Petroleum. Petroleum and its produce are very important for the growth and expansion of many industries in India. The products of petroleum are petrol, fuel oil, kerosene and lubricants for use in automobiles, railways, steamships, machines in manufacturing industries and others.

There is at present not much production of oil within the country except for about 400,000 tons which is obtained from the Digboi area in Assam. Refineries are, however, being set up to process crude oil—both indigenous and imported—into marketable products.

India's demand for mineral oil is to the extent of about 6 million tons. The rate at which the consumption is increasing will call for about 17 million tons in 1965.

OIL CONSUMPTION IN INDIA FROM 1948 to 1958 AT A GLANCE

Total Inland Consumption (in million tons)	1948 2·2	1951 3·6	1956 4·8	1958 5·6	1961 6·1
		Break-up in %			
Motor Spirit	21%	23%	17%	14%	
Kerosene	25%	29%	31%	28%	
High Speed Diesel Oil	3%	7%	11%	16%	
Light Diesel Oil	13%	11%	9%	9%	
Furnace Oil	2%	17%	15%	18%	
Other Products (including minor products like Aviation Fuels, Lubricants, Bitumen, Wax, etc.)	16%	13%	17%	15%	

The demand for kerosene oil in India is the highest in the world, constituting as it does about 30 per cent of the country's requirements of petroleum. Since the oil production within the

country is not sufficient to meet even 5 per cent of the total requirements, large quantities are imported from Iran, Bahrein Islands, Saudi Arabia, U.S.A. and Indonesia.

IMPORT OF MINERAL FUELS AND LUBRICANTS

		1959-60 Rs. lakhs	1960-61 Rs. lakhs
i.	Petroleum crude & partly refined ...	17,55	20,15
ii.	Motor spirit ...	3,55	3,59
iii.	Kerosene	23,58	22,80
iv.	Fuel oils	25,63	5,47
v.	Lubricating oils ...	14,27	15,33
	Total value ...	86,84	69,50

Oil was first discovered in India at Makum in north-east Assam in 1867. It was not, however, possible to start drilling for oil before 1882 because of the lack of communications. The place that was selected to drill for oil was Digboi. The Digboi field in the Lakhimpur district of Upper Assam covers an area of 2½ square miles and is the most important oil-producing field in India. The important oil centres are Digboi, Bappapung and Hansapung. The Digboi oilfields produce about 400,000 tons of crude petroleum annually. The workers in the Assam oilfields are mainly drawn from Assam, West Bengal, Nepal and the U. P. The percentage of the workers from Assam is 22. In the Surma Valley some oil of poor quality is found in Badarpur, Masimpur and Patharia. Drilling was commenced at Badarpur in 1911 but due to decreasing production the operations were closed down in 1923.

The oilfields of Assam are connected with Calcutta by a direct railway link through Indian territory. The railway runs as far north as Sadya, a little north of Digboi. Digboi is connected by a branch line with Dibrugarh, an important river port. The Cachar field is practically on the main line of the Assam sector of the North Eastern Rly. The Assam oilfield is now producing about 5,000 barrels a day. This crude oil has the advantage that large quantities of wax can be extracted from it.

India's oil requirements are so rapidly increasing that the foreign exchange burden of importing crude oil has become quite heavy. The main problem is, therefore, to discover and develop commercial reservoirs of crude oil to meet our need.

Till 1947, the general opinion was that outside Assam, India had little prospect of any oil-field of industrial and commercial importance. Even in Assam, exploration gave disappointing results. Subsequent investigations and surveys have proved beyond doubt that India has rich oil-bearing areas.

THE POSSIBLE OIL-BEARING SEDIMENTARY BASIN IN INDIA

	Approximate area in sq. miles
The region of Assam (including Tripura and Manipur)	30,000
The West Bengal basin (including part of coastal Orissa and the Sundarbans) ...	30,000
East Punjab, Himachal Pradesh, Jammu and Kashmir	50,000
Rajasthan	46,000
Cambay-Cutch	68,500
Ganga-Valley	142,000
Madras coast	17,000
Andhra coast	9,500
Travancore coast	6,000
Andamans and Nicobar	3,000

The possible oil bearing areas in India are the Himalayan foothills from Assam to Jammu, the marshy Sundarbans region of West Bengal, the Indo-Gangetic basin front of the Siwalik hills, the Cutch-Saurashtra-Cambay region and the coastal areas of Orissa, Andhra and Madras on the east and Kerala on the south-west. In fact, from the continental shelf area, India has a potential area of 400,000 square miles for oil exploration.

Oil has already been discovered as a result of exploration work in Jwalamukhi (Himalayan foothills) and Lunej in the Gulf of Cambay region.

Natural Gas has been found at Jwalamukhi, in the Punjab and at Mahuvej, Ghogha and Vadesar, in Baroda. The gas reserves at these localities are thought to be quite considerable.

The natural gas reserve of the Naharkatiya-Hurijan oilfields has been estimated at 481,000 million cu. ft.

The oil policy of the Government of India is that establishment of new oil undertakings will be the exclusive responsibility of the state except where it is found necessary to secure co-operation of private enterprises, subject to control and regulation by Government. The Oil and Natural Gas Commission which was set up in 1959 has been undertaking, on an intensified scale, geological surveys and investigations for the development of petroleum resources. The success of the Commission, however, will depend on the extent to which technical and financial resources will be made available for the purpose. The work of the Commission has led to the discovery of oil and gas in the Cambay-Ankleshwar area of Gujarat and the Sibsagar area in Assam. Foreign oil explorers are also invited to join in the search for oil in India, subject to mutually acceptable terms.* In the public sector the Oil and Natural Gas Commission propose to spend about Rs. 200 crores on exploration and production operations, and they aim to achieve a production target of about $3\frac{1}{2}$ million tons per year during the final year of the Third Five-Year Plan.

Oil is an integrated industry inasmuch as from exploration, production, refining to marketing is a continuous process. There are at present three Government organisations to handle these various aspects of oil industry—(*a*) *Oil and Natural Gas Commission* for exploration and production, (*b*) *Indian Refineries Ltd.* for constructing and operating the refineries and (*c*) *Indian Oil Company* for distribution and marketing the petroleum products.

Petroleum is being refined in India by the public sector and the foreign companies. In 1948, the Government of India gave concessions to international companies—Burma-Shell, Standard Vacuum and Caltex—to set up three refineries, two in Bombay and one at Visakhapatnam. These concessions were granted in order to create more refining capacity as early as

* The Burma Oil Company has entered into an agreement on a 50:50 partnership basis for exploration and exploitation of mineral oil in specific area in the north-east region. The Oil Commission has also reached an agreement with the French Petroleum Institute for joint operation in Rajasthan.

possible. The foreign companies have located their refineries in Bombay, Visakhapatnam and Digboi. The two refineries in Bombay (Burma-Shell and the Standard Vacuum) have a refining capacity of 5 million tons a year. Visakhapatnam (built by Caltex) refines about a million tons of crude oil a year. The refining capacity of Digboi is 0·5 million tons. These three refineries are being run according to agreements with India Government such as exemption from nationalisation for 25 years, freedom from certain provisions of Industries (Development and Regulation) Act and some duty concessions. All these refineries use imported crude oil as well as Indian crude oil whenever available. The selection of Vishakhapatnam as a site for the refinery was based on the following considerations:

(*a*) the facilities of a fine harbour for handling ocean going tankers,

(*b*) rail access by the South-Eastern and Southern Railways to provide for inland distribution;

(*c*) road access by means of the Grand Trunk Highway for local deliveries, and

(*d*) the need for a new, major industry in this area.

The State-owned refineries are being located at Gauhati (Assam), Barauni (Bihar) and Cambay (Gujarat). Gauhati will produce almost the entire range of petroleum products: Kerosene, Petrol, High Speed Diesel Oil (HSD), Light Diesel Oil (LDO), Furnace Oil etc.; supplying over 2,000 tons (nearly 25 lakhs of litres) per day of vital oil products for India's ever-growing needs. The Gauhati Refinery is a major step forward in the Government's plan to cater to the growing demand for petroleum products and also help make the country self-reliant in this vital commodity. A second State-owned refinery is under construction at Barauni (Bihar) and a third public sector refinery is being planned in Gujarat. The total refining capacity of the public sector refineries may reach 12 million tons on the basis of the estimated production of oil from Assam and Gujarat. The Indian Oil Company, first company in public sector to undertake marketing and distribution of petroleum products in India, has its headquarters at Bombay. It may be mentioned here that the entire petroleum trade in the country till 1961 was in the hands of foreign companies viz., Burma-Shell,

Standard Vacuum, Caltex, and Indo-Burma Petroleum Co. The entry of the Indian Oil Company as a State enterprise in the distribution trade is a significant economic event. Indian Oil Company (IOC) is the sole marketing agent for all products refined by the Gauhati Refinery and other public sector refineries. Its objectives are to obtain oil from Indian soil, or anywhere in the world ; to buy where available, to store where needed, and to distribute even to the remotest villages. This new State-owned enterprise (IOC) is already marketing plentiful supplies of High Speed Diesel Oil and Superior Kerosene throughout the country, imported against rupee payment. To help ease the growing demand for oil products, IOC will continue to secure such products that are in deficit from any country in the world at the most advantageous prices. IOC has brought about the active participation of the Indian people in the control and distribution of oil, the essential commodity of progress.

Soon there will be a pipe line from Naharkatiya oilfields in Assam to carry oil to Barauni oil refinery. Throughout its entire length of 720 miles, the pipe line will be in a position to carry crude oil to Nunmati upto 4 million tons, and 3·25 million tons per annum between Nunmati and Barauni. The 250 mile long pipe line connecting Gauhati refinery (Noonmati) with the Naharkatiya oilfield has been completed and is in operation. The remaining 470 mile long pipe line upto Barauni is under construction. This pipe line system, traversing a difficult terrain, cutting across three State boundaries, will be the second largest in the East. On its completion Oil India would be in a position to meet its commitments of supplying nearly 3 million tons a year to the Refineries at Gauhati and Barauni and the Assam Oil Company Refinery at Digboi. This total production of 3 million tons would mean a foreign exchange saving of more than Rs. 20 crores a year.

The location of refinery at Barauni, though not an ideal one, has the advantage of nearness to the industrial regions of the north and railway connections with the eastern regions. The refinery at Gauhati is located on the bank of the Brahmaputra which is navigable through out the year with regular steamer services to connect Calcutta. Gauhati is also a railway centre, the importance of which has increased because of the construction of a railway bridge at Pandu, 3 miles from Gauhati.

Estimated Requirements of Petroleum Products

(In 000 tons)

End Products		Requirements by 1965*	Production from refineries	Deficit or Surplus
Kerosene	...	2,660	1,282	– 1,378
High Speed Diesel	...	2,607	1,578	– 1,029
Motor Spirit	...	1,123	1,537	+ 414
Furnace Oil	...	2,753	1,930	– 823
Aviation Turbine	...	408	189	– 219
Lubricants	...	409	71	– 338
Others	...	1,710	1,326	– 384
Total	...	11,723	7,923	– 4,214

The above estimates are very conservative because in 1962 the level of consumption was above 9 million tons. For 1965-66, the latest consumption estimate is just over 17 million tons. The Government has plans to step up the projected capacity of three public sector refineries and to construct a new refinery in South India in collaboration with private interests.

The Development of Hydro-electricity

Cheap power is the vital need of the country at the present moment. Coal, oil, natural gas and nuclear fuels are to be consumed in order to produce energy. In the case of hydro-electric generation, however, flowing water as the source of energy is inexhaustible. The aggregate water-power potential of India is very great being in the neighbourhood of 40 million kw. The magnitude of the water-power resources will be patent from the fact that India today exploits only about six per cent of her water-power potential.

The ratio between the total water-power developed in various countries and their estimated water-power was as follows in 1958:

Soviet Russia ...	36	Norway	60
France	34	Canada	40
Germany	58	U.S.A.	29
Switzerland ...	69	India	6
Sweden	30		

* Estimates by Oil Advisory Committee in March, 1961.

Possibilities are, therefore, immense in India for the development of water-power. Indeed, India promises to be one of the leading countries in the world in the development of hydro-electric power. The great advantage of water-power is that in the process of power generation, we merely utilize the gravity of water and do not consume any substance. "If we do not put this resource to use, we are not storing or preserving, we are merely wasting it."

Water-power schemes are, generally, difficult of materialisation in India, because the power needs to be continuous, while rainfall is seasonal. Hence, costly storage works are indispensable. Favourable sites for storage works exist in many parts of the mountainous and hilly regions where the rainfal is heavy. Hydro-electric schemes have developed in Maharashtra, Mysore, Kashmir, Madras, U.P. and Punjab. Western India has practically no coal; but this is compensated for by the magnificent hydro-electric power resources in the Ghats.

With the completion of the multi-purpose project and several other schemes that have been undertaken in India, about 9 million k.w. of hydro-electric energy will be available by 1965.

In the Western Ghats of Maharashtra, three earliest hydro-electric power stations are at *Lonavala, Nila Mula and the Andhra Valley*. The Lonavala works are situated at the top of the Bhor Ghats where rain water is stored up in three lakes, namely, Lonavala, Walwan and Shirawata from where it is conveyed by canals and pipe lines to Khopoli at the foot of the Ghats for generating power. The Andhra Valley Power Supply Company is situated at Bhivpuri on the Andhra river where a reservoir has been constructed by means of a dam across the river. To the south-east of Bombay on the Nila Mula river a great hydro-electric scheme was developed in 1927. All these three works have been developed through the enterprise of the Tata organisation of Bombay to provide Bombay, Thana, Kalyan and Poona with electricity for light, power, traction as well as numerous domestic and industrial applications. Water deposited by the monsoon rains on the Western Ghats normally finds its way to the Bay of Bengal by flowing in an eastwardly direction while dropping. in its course of several hundred miles, between two and five thousand feet. The abrupt drop in the westerly direction was observed by engineers in the latter part

of the last century to be a source of great potential energy provided a scheme could be devised to store and divert a portion of the water from the eastern to the western watershed and harness this energy at the time of its drop from the higher to the lower levels. The achievement of "harnessing the monsoon" gave birth to "The Tata Hydro-Electric System." It has been estimated that hydro-electric potential of the rivers of the Western Ghats is 42 lakh kw. Some of the more recent projects that are under construction are Bhira, Koyna and Vaitarna in Maharashtra.

Southern India has developed, in recent years, hydro-electric powers at various places. The total installed capacity of hydro-electric power in South India is about 230,000 kw. although 2 million kw. can be made available. Madras has about half of this resource and the rest are in Mysore and Kerala. This power is in great demand in the villages of the South for lifting water from wells for irrigation purposes. The power is also extensively used in Madras, Kerala, and Mysore for industrial purposes like development of electro-chemical and fertiliser factories, textiles, machine tools, aluminium etc. In future electrification of Southern Railways will make the area free from dependence on Northern India for coal to the extent of 1 million tons a year. The first hydro-electric scheme was given effect to in India in 1920 on the Cauvery river in Mysore with the object of supplying power to the mining companies in the Kolar gold-fields. The power house is situated at Siva Samudram, 92 miles from the Kolar fields. At present power is transmitted not only to the Kolar gold-fields but also to Bangalore and to about 200 other towns of Mysore. In Kerala there is one hydro-electric station at Pallivasal which generates about 22,500 kw.

There are three important hydro-electric power stations in Madras: (*a*) Pykara, (*b*) Mettur and (*c*) Papanasam. The Pykara Hydro-electric Scheme was developed in 1932 on the Pykara river in the Nilgiri district. Power is transmitted to Coimbatore, Erode, Tiruchirapally, Negapatam, Madurai and Virudhnagar.

The Mettur Hydro-electric Scheme is situated immediately below the Mettur Dam on the Cauvery. The Mettur Dam, one of the largest of its kind in the world, has been constructed mainly for irrigation, and part of the water let down for irrigation is utilised to the best advantage for the generation of hydro-

electric power. The Mettur power scheme provides the districts of Salem, Tiruchchirapalli, Tanjore, North Arcot, South Arcot and Chittur with energy. The Mettur scheme is linked with the Pykara works at Erode. Madras has another scheme on the Tamraparni river at the foot-hills of the Western Ghats above Papanasam in the Tinnevelley district which supplies to Tinnevelley, Koripatti, Madurai, Tenkasi and Rajpalayam. In the matter of rural electrification, Madras State is the leader. About 1,500 villages receive electricity in Madras. The textile mills, cement factories, steel works, aluminium works, paper mills, railway workshops, etc., use hydro-electric power in Madras.

During the First and Second Plans, the following hydro-electric power stations were commissioned in South India:

Andhra Pradesh: Nizamsagar hydro-electric scheme; Machkund Project; Tungabhadra;
Madras: Kundah; Periyer;
Mysore: Jog power; Sharavathy;
Kerala: Poringalkuthu; Neriamangalam.

In Punjab the Uhl River scheme supplies 50,000 kw. power to the Railways and to several industrial towns like Amritsar and Ludhiana. The Uhl from which the power is generated is a small river. The transmission system serves all big towns lying in the belt between Gurdaspur and Ferozepore as well as Simla, Ambala, Patiala and Gujranwalla. In the near future the supply will be extended to Saharanpur, Meerut, Delhi and districts of Karnal, Panipat, and Rohtak. The scheme aims at providing industrial power and light to the towns of the Punjab and assisting agriculture in a number of ways by preventing water-logging and raising water to the required level on irrigated lands. The Nangal scheme gives 48,000 kw. of power. The Bhakra project will soon be ready to supply power not only to Punjab but also to Western U.P., Delhi and Rajasthan to the extent of 207,000 kw.

In U.P. hydro-electric installations have been opened to supply power to agriculture and industries. The Ganga Canal in its course from Hardwar to Meerut passes over 12 falls which range in height from 10 to 15 ft. The Government of the province made a scheme in 1926 to obtain energy from these falls and at present there are seven hydro-electric stations, situated as

follows: Bahadurabad, Mohammadpur, Chitaura, Salawa Bhola, Palra and Sumera. More than fourteen districts of the Upper Ganga area are served by these hydro-electric works. The Pathri hydro-electric scheme which was completed during First Plan has the installed capacity of 20,400 kw. The Sardar Hydro-electric project at Banbassa, Uttar Pradesh, is one of the important development projects of the State and gives 41,400 kw. of power. Three other generation schemes are Matatila hydro-electric project, Jamuna hydro-electric project and Ramganga hydro-electric project which together will have total installed capacity of 477,500 kw. Rihand Project has 250,000 kw. capacity.

As a result of the development of hydel and thermal power stations in India, the annual per capita consumption of electricity has gone up to 30 units in 1961 as against 13 units in 1948. This power is utilised in big industries, in the sector of small-scale and cottage industry, in irrigation and in villages.

PRINCIPAL HYDEL POWER SCHEME, 1961

Name	Area	Installed Capacity kw
Nizam sagar	Andhra Pradesh	15,000
Manchkund	A.P. and Orissa	114,000
Pykara	Madras	27,200
Bhira	Maharashtra	22,000
Jog	Mysore	72,000
Nangal	Punjab	48,000
Pathri and Sarda	U.P.	61,800
Tungabhadra	A.P. and Mysore	36,000
Maithon and Panchet	D.V.C.	100,000
Neriamangalam	Kerala	45,000
Periyar	Madras	105,000
Kundah	Madras	145,000
Hirakud	Orissa	123,000
Bhakra-Nangal	Punjab	207,000

QUESTIONS

1. Examine India's power resources and explain how far they are adequate for the future industrialization of the country.

(Agra B.Com. 1953).

2. Analyse the geographical conditions suitable for the development of hydro-electric power. How far are these conditions in existence in India? Give a brief review of the development of this power since 1950.

(Cal. B.Com. 1948, 1953, Raj. B.Com. 1960).

3. Describe the present position of the petroleum resources in India, and indicate the extent to which the resources have been exploited.

(Rajasthan B.Com. 1962).

4. What are the principal sources of power in India? Discuss the prospects of wind-power in India.

5. Examine the importance of coal and hydro electricity in India from the point of view of industrialisation.

6. Account for the location of oil refineries in Visakhapatnam, Barauni and Gauhati.

7. What are the principal sources of industrial power in India? Discuss their distribution, utilization and future outlook.

8. 'We have to depend mainly on water power which as cheap motive power is the first *sine qua non* for industrial development." What are the areas where such utilisation is being made in India?

(Rajasthan B.Com. 1957)

CHAPTER XII

PRINCIPAL MANUFACTURING INDUSTRIES

Within recent years, India has made tremendous progress in the development of manufacturing industries under Five Year Plans. Industrial development is being pursued both in the public and private sectors on a pattern of mixed economy. In addition to the expansion of the existing industries, a number of basic and capital goods industries like iron and steel, chemicals and fertilisers, heavy electrical and heavy machine tools etc. have been set up to obtain a balanced economic growth. Because of the rapid growth and diversification of industry, the past decade may be described as the beginning of an industrial revolution in India.

From the point of view of distribution of manufacturing industries, the geo-economic forces like raw materials, power, labour, transport, markets and finance have influenced the location pattern in India. These bases or forces also explain the reasons for concentration of certain industries in definite areas. Industries which use raw materials in their primary stage in large quantities are usually located near the source of raw materials. This is because some of the raw materials lose their weight in the process of manufacture or cannot bear high transport cost or cannot be transported because of their perishable character. Sea ports are generally preferred when the raw materials are to be imported. The availability of raw materials in the neighbourhood is responsible for the concentration of jute mills in West Bengal, iron and steel in Bihar and Bengal, sugar factories in U.P., and cotton mills in Maharashtra, Gujarat and Madras. The concentration of a number of industries in South India, Maharashtra, Bihar and West Bengal has been due to the development of electric power from coal or water in these regions. The availability of power, fuel and facilities for transport greatly determine the rate at which an industry can grow in India.

Broadly speaking, the manufacturing industries in India may be classified under two groups from the viewpoint of

planned development in the national interest: (*a*) those in the Public Sector and (*b*) those in the Private Sector.

The industries in the Public Sector are being run in one or other of the following manners: (*a*) as a Government Department, (*b*) as a Corporation (*c*) as an organisation under company law.

Some Important Public Sector Industries

Iron and steel ...	Rourkela, Durgapur and Bhilai (Orissa, Bengal and Madhya Pradesh)
Petroleum refineries ...	Nunmati (Assam), Barauni (Bihar)
Machine tools ...	Bangalore
Newsprint and paper mill	Nepa (Madhya Pradesh)
Salt	Sambhar and Didwana (Rajasthan) and Kharaghoda (Maharashtra).
Heavy Engineering ...	Hatia (Bihar)
Fertilisers	Sindri (Also in Rourkela and Bhilai)
Ship-building ...	Visakhapatnam
Aircraft	Bangalore
Chemicals and fertilisers	Nangal and Trombay
Heavy Chemicals ...	Bhopal (Madhya Pradesh)
Cables for Telegraph ...	Rupnarayanpur (West Bengal)
Antibiotics	Pimpri (near Poona)
D.D.T.	Delhi and Alwaye (Kerala)
Locomotives ...	Chittaranjan (Bihar)
Electronic Equipment ...	Bangalore

Thus it will be observed that areas which were formerly industrially backward have excessive concentration of the Public Sector industrial investment. "Preference in fact has always been given to the location of public sector projects in relatively backward areas whenever this could be done without significant prejudice to technical and economic considerations; and this will be the guiding principle for the future also."* Even in the private sector projects, the claims of under-developed regions are kept in view.

* The Third Plan, p. 455.

The extension of the public sector into fields requiring the establishment of large scale units and heavy investments, the encouragement for developing medium and small-sized units and the opportunities for new entrants in the industrial field are aimed at preventing concentration of economic power in the hands of a few entrepreneurs, and promoting a pattern of industrial organisation which will lead to high levels of productivity against the background of the goal of a Socialist pattern of society.

Mention may be made here of the foreign private investment in Indian manufacturing industry. In manufacturing industry, British private investment stands at Rs. 129 crores, as against Rs. 21·5 from U.S.A., Rs. 7 crores from Switzerland and Rs. 6·9 from western Germany. Official investment from abroad in private sector in India amounts to Rs. 124 crores, 50 per cent of which came from the World Bank and 25 per cent from the U.S.A.

Industrial Areas

Though manufacturing industries are scattered throughout the country, there are three principal zones:

(1) The Damodar-Hooghly Zone covers the south-eastern part of Bihar and the southern part of West Bengal. The industries are iron and steel, fertilisers, locomotives, jute, cotton, chemicals, paper, automobiles, glass, silk, aluminium etc. The chief source of power is coal.

(2) The Western cotton-belt zone includes Maharashtra and Gujarat with industries like rayon, cotton, wool, paper, chemicals, glass, sugar, automobiles etc. in Bombay, Baroda, Ahmedabad, Surat, Poona etc.

(3) The Southern zone, a quadrilateral area covering Madras, Madurai, Coimbaore and Bangalore is noted for cotton, silk, chemicals, sugar, iron and steel, glass, aircraft, telephone equipment etc.

Both in the West Zone and the Southern Zone, the chief source of power is hydel.

Two other industrial areas in India are confined to (*a*) the Ganga-Jamuna region with Allahabad, Kanpur, Lucknow, Delhi for paper, cotton, leather, wool, glass, sugar, chemicals; (*b*) the Central region with scattered centres like Nagpur, Jabalpore, Bhopal and Indore for textiles, cement, heavy chemicals, paper etc.

From the point of view of the number of workers employed in factories, Maharashtra State occupies the first place with about a million workers, followed by West Bengal with about 750,000 daily workers.

The Cotton Textile Industry

India is now one of the leading cotton manufacturing countries of the world; she is second in the production of cotton and third in the number of persons employed among the countries manufacturing cotton. Indeed, "the Indian Cotton textile industry is the most significant example of national achievement in the industrial sphere and is a symbol of India's potentialities as an industrial country."

The importance of the cotton industry can be judged from the fact that (*a*) it has nearly 12 per cent of the total paid-up capital of all joint stock companies in India; (*b*) next to tea and jute, foreign exchange earnings from cotton is large; in 1959-60, the exports of cotton fabrics and cotton twist and yarn contributed about Rs. 70 crores towards foreign exchange; (*c*) it has 30 per cent of the industrial labour. In fact, it is the biggest employer of industrial labour in India. In 1960, more than 850,000 labourers were engaged on daily wages. In addition there are more than 50,000 persons as technicians and managers. (*d*) It supports a number of ancillary industries like dyes and chemicals, mill stores and packing materials. "The value of such materials consumed by the industry is roughly Rs. 41 crores per annum." (*e*) More thon 1·5 million weavers in the handlooms industry obtain their yarn requirements from the textile industry and produce 1,500 million yards of cotton a year.

The first cotton mill in India was started in Ghoosery on the Hooghly in 1822. The real progress started from 1854 when Bombay had its first cotton mill. The industry received

considerable impetus for its growth on account of the Swadeshi movement which started in 1905. Subsequently the grant of fiscal protection from 1927 onward helped the industry to develop rapidly. At the end of the year 1960 there were 191 spinning mills and 292 composite mills in India. It may be noted that the cotton textile industry in India from its very inception was developed and financed by Indians.

Though the industry is scattered over more than 76 towns in India, four areas lead in the production of cotton goods. These are Maharashtra and Gujarat, West Bengal, Madras and the U.P.

COTTON MILLS IN INDIA (August 1961)

	No of Mills	Spindles (in 000)	Looms (in 000)	No. of Workers (in 000)
Bombay city	63	3,225	63	197
other Maharashtra	37	940	19	62
	100	4,166	82	259
Ahmedabad	72	2,131	42	136
other Gujarat	40	859	15	47
	112	2,990	57	182
Rajasthan	11	178	3	10
Punjab	6	132	2	8
Delhi	7	192	4	18
U.P	29	874	14	52
Andhra	15	220	1	12
M.P.	20	519	13	43
Bihar	2	26	0.7	1
Orissa	4	53	1	5
West Bengal	40	623	10	44
Madras	139	3,223	8	103
Kerala	14	183	2	7
Mysore	21	516	5	27
Pondicherey	3	84	2	6
Total India	523	13,985	207	778

The cotton mill industry consists of two sections—the spinning mills and the composite (spinning and weaving) mills.

The lines of cotton manufactures consist of yarn and woven goods; and these supply more than 80 per cent of the country's requirement for mill-made goods. The woven goods are grey and bleached piece-goods, coloured piece-goods, hosiery, cotton goods mixed with silk or wool and miscellaneous. In 1960, India produced 1750 million lbs. of yarn and 5127 million yards of cloth. The production of yarn and cloth has increased considerably since 1950-51. About 72 per cent of the cloth production is medium quality, 15 p.c. coarse quality and 13 p.c. fine and superfine.

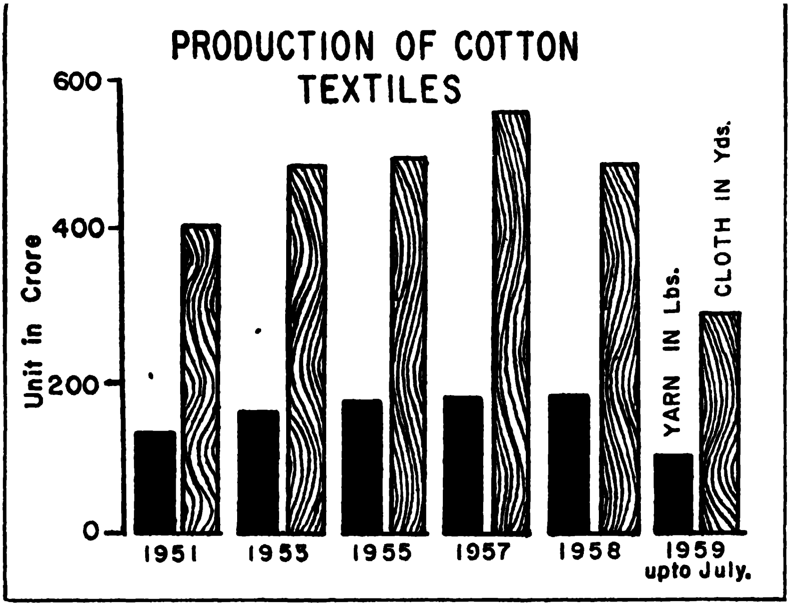


FIG. 48. The trend of progress in cotton textiles during the first and second plan periods.

Maharashtra and Gujarat have 212 mills, of which Bombay Island and Ahmedabad possess 63 and 72 mills respectively. Judged by the quantity and value of production, Bombay ranks first in the list of cotton manufacturing centres. Next to Bombay, Ahmedabad is the second largest cotton-manufacturing city in the country. In the State of Maharashtra, the second centre is Sholapur followed by Poona, Yeotmal, Nagpur and

Jalgaon. The size of the cotton mills in Bombay is usually large in view of the fact that the mills are public limited companies and have been in the market for long.

The localisation of cotton industry in the city and Island of Bombay has been governed not so much by natural and permanent factors as by capital and credit advantages, the presence of adequate means of communication and the fact of Bombay being a port. The vast capital which the members of the Parsi and Gujrati communities had acquired from export of raw cotton through Bombay in the eighties and nineties of the last century provided impetus to the location of cotton mill industry in Bombay. The climatic condition of Bombay is such that it favours the production of yarn of finer counts,

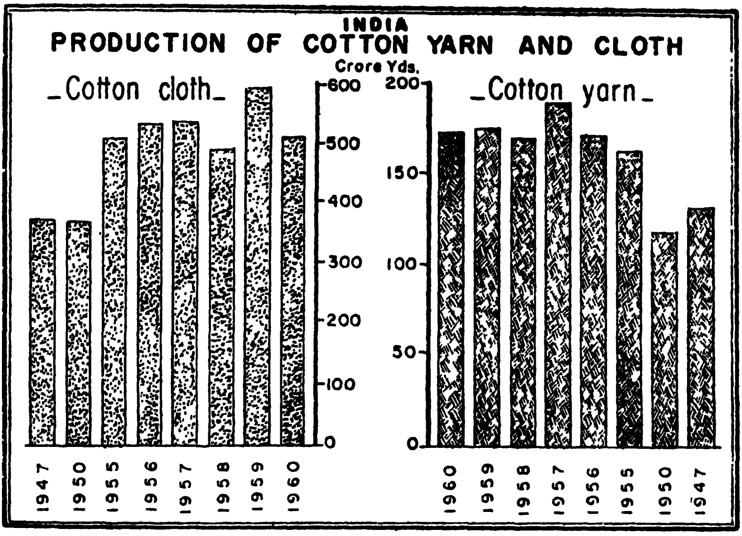


FIG. 49. Production of yarn and cloth in India after Independence. The unit for the yarn is the crore lbs.

but the preponderance of higher counts is a feature of the Ahmedabad cotton industry and not so much of Bombay. Again, Khandesh, Berar and Wardha, where raw cotton is grown, are nearer to Ahmedabad than Bombay. When the cotton textile industry was established, Bombay had not developed hydro-electricity and depended on Bengal for coal. The cotton industry in Bombay city draws its labour force mostly from the neighbouring districts of Konkan, Satara, and

Sholapur. The supply of labour also comes from the Deccan and the Uttar Pradesh.

In spite of these defects, Bombay is still the principal centre of the industry. It proves, therefore, that certain advantages are definitely on the side of Bombay: (*i*) Credit and banking facilities, (*ii*) the natural harbour. The cotton crop of the hinterland gravitates in large quantities to Bombay for export and so a special flow of cotton for the purpose of mills need not be created. The port also enables Bombay to import machinery and other requirements from England, Germany and U.S.A. with ease.

Therefore Bombay has combined the textile specialisation of Manchester with the commercial and shipping characteristics of Liverpool.

The bulk of the cloths produced in Bombay City consists of light texture cloths made from medium count yarns. During recent years many Bombay mills have specialised on fine count cloths. Longcloth, shirting, T. cloths, domestics and sheetings account for more than 50 per cent of the production, while the remainder consists of dhoties and coloured goods.

The first cotton mill at Ahmedabad was started in 1859. The industry has made tremendous progress since 1929. In 1960, the city had 72 mills and employed about 136,000 workers. The principal sources of labour supply are Ahmedabad district, Baroda and Gujarat. About 60 per cent of labour comes from these places. Rajasthan supplies about 12 per cent of labour force. Ahmedabad is capable of producing almost any grey, bleached, woven, coloured or printed cotton fabric in general demand. Her annual production exceeds 1.000 million yards of piece-goods. Ahmedabad also produces dhoties and saries on an extensive scale.

The plain of Berar and Nagpur lying to the west in the valleys of the Purva and Wardha rivers contain rich black soil which makes the area a great cotton growing one. The cotton mills in this region are located at Nagpur and Akola. From the point of view of labour employed, Nagpur is the most important Cotton textile centre in eastern Maharashtra State. A large proportion of the workers in the Nagpur mills belong to what are known as the scheduled castes.

The Cotton Mill Industry in West Bengal has made exceptional progress in the last ten years. At present production is mostly confined to grey and bleached goods with dhoties for home consumption predominating. There are now 40 cotton mills in West Bengal. The industry is located in three districts, namely, 24-Parganas, Howrah and Hooghly—all along the Hooghly basin, within a radius of 32 miles from Calcutta. The Hooghly basin offers unique opportunities for the development of industries inasmuch as the area is served by a perfect network of railways and riverways. Calcutta, by bringing mill machinery and raw cotton from abroad, distributes them to the different cotton centres of the Hooghly basin. The economic advantages of Calcutta in being near to Jharia and Raniganj coal-fields, besides being itself a money and labour market, have influenced greatly the concentration of cotton textiles around the city. The mill centres are Sodepur, Serampore, Panihati, Shamnagar, Maurigram, Belgharia, Palta, Fuleshwar, Salkia and Ghoosery—all in the districts of Howrah and 24-Parganas. In 1960, the West Bengal cotton industry employed 50,000 workers.

West Bengal is a great market for cotton goods in India. The Bengal mills cannot satisfy the local demand to any appreciable extent. Thus the Bengal mills have before them a wide scope for expansion. Moreover, the neighbouring states of Assam, Bihar and Orissa will offer a vast market for the Bengal mills.

The moist climate of Bengal is no less important. Cotton industry requires moist atmospheric conditions, otherwise the thread breaks. The climate of the state is certainly an advantage, if not over Bombay and Ahmedabad, at least over the upcountry towns of Kanpur and Delhi, where the humid atmospheric conditions are created in the mills artificially. As regards labour, "a factor very much in favour of the Bengali labourer is that he is more intelligent, though physically a bit poorer, than outside labourers. But workers in the mills do not presumably require very strong physique, because the operations are such as require a sensitiveness to touch and flexibility of fingers more than physical exercise, which it does not take a long time to develop."

The only problem is the question of raw materials in view

of the fact that about 223,000 bales of raw cotton are consumed. a year in West Bengal cotton mills. Bengal is situated far from the cotton-growing areas of India. But then, the high price paid for raw cotton will be compensated largely by the economy in the freight on coal.

The cotton-manufacturing industry of Uttar Pradesh with 29 cotton mills is highly organised and employ 52,000 workers. Its disadvantage of being located far off from the coal-fields is compensated by the presence of a large local market, cheap and efficient labour and excellent transport facilities. The cotton industry is particularly confined to the Ganges towns. *Kanpur is the most important cotton manufacturing centre.* Although the first cotton mill at Kanpur was started as early as 1861, the real progress was noticeable from 1935 onwards. The city has now 17 cotton mills. The bulk of the labour force in the mills comes from the neighbouring agricultural areas. The cotton manufactures in the U.P. are yarn, grey and coloured piece-goods, hosiery and carpets. The U.P. produces about 250 million yards of cloth per annum, of which grey and bleached goods account for 95 per cent of the production. Cotton carpets are becoming important of late, and the centres of manufactures are Bareilly, Aligarh, Agra, Moradabad and Etwah. Tentage and *dosuti* fabrics are made in Kanpur.

The growth of the cotton mill industry in South India during recent years has been phenomenal. South India possesses certain geographical advantages in respect of raw materials and power resources developed as a result of hydro-electric schemes. The rapid development of textile mills in the south was noticeable after 1932 when the hydro-electric supply was made available. Apart from the fact that the best staple varieties of cotton are grown in the region, the South has a large consuming market. The dispersal of the industry in the various parts of the region is on account of the location of hydro-electric units. There are about 189 cotton mills in the south including Andhra (16), Madras (139), Mysore (21) and Kerala (14). The districts of Coimbatore, Madura, Tinnevelley and Ramnad are important zones. The cotton mill centres are Coimbatore (41 mills), Madurai (10 mills), Salem (4), Tinnevelley (4), Malabar (5), Madras, Guntur, Bellary and East Godavari. Mysore, Trivandrum and Padukota are other centres.

Though the mills are scattered over the different centres, the greatest concentration has been around Coimbatore. The availability of Cambodia cotton in the neighbourhood, the plentiful local labour, the moist climate so necessary for spinning and the facilities of transport by road and railways have made Coimbatore one of the most important cotton manufacturing centres in India. The hydel power from the Pykara project is used extensively by the cotton mills at Coimbatore. The South Indian cotton mills concentrate mostly on spinning as about 16 p.c. of the total spindles of India are to be found here. Only 4 per cent of the total loomage of India is in South Indian mills. The spinning mills supply yarn mostly to the handloom industry for which South India is noted. The expansion of weaving mills, therefore, is not in the interest of the handloom industry. "The mill industry in the South is so closely linked to and dependent on the handloom industry that vicissitudes of one equally affects the other." The handloom industry employs 12 lakh weavers as against 138,000 workers in the textile mills of the south.

Madhya Pradesh is an important centre of cotton manufacture in India with 20 mills and 44,000 daily workers. The cotton mills are located at Gwalior, Indore, Bhopal and Rajnandangaon.

Delhi with seven cotton mills specialises in the production of coarse count cloths and produces considerable quantities of dhoties and tentage materials and excellent upholstery and tapestry fabrics. In 1960 Delhi produced about 84 million yds of cloth.

Long-stapled cotton requirements of Indian mills are met by importation from Egypt, East Africa, Sudan, U.S.A. and Pakistan. The Indian mills consume annually about 4·8 million bales (400 lbs. each) of raw cotton, of which about 10 p.c. is imported from abroad. The imported variety is long-stapled cotton. About 60 p.c. of the imported cotton is of American variety, followed by East Africa (10 p.c.), U.A.R. (16 p.c.) and others.

It will be observed that the dependence on foreign raw cotton has been very much reduced, being hardly 10 p.c. of the total requirements compared to more than 33 p.c. in 1950.

RAW COTTON CONSUMED BY INDIAN MILLS

(Thousand bales of 392 lbs.)

	Indian Cotton	Foreign Cotton	Total
1950	2,421	1,071	3,492
1952	3,234	1,025	4,259
1956	4,372	619	4,991
1958	4,440	524	4,964
1960 ...	4,600	390	4,990

The average share of cotton piece goods in the total exports of our country has been nearly 15 p.c. The destinations are U.K., Indonesia, Sudan, Nigeria, Australia, Kenya, Ethiopia, Tanganyika, Singapore and Ceylon. Other important markets are Afghanistan, Burma, Rhodesia and Saudi Arabia. Some of these markets, particularly Ceylon, Burma and Indonesia, are developing their own cotton textile industry. But there is significant scope for increasing our cotton exports in many other countries of Asia and Africa.

SHARE OF COTTON CLOTH EXPORTS TO PRODUCTION IN INDIA

(In million meters)

Year	Production	Export	P.c. of exports to production
1958 ...	4476	562	12·6
1959 ...	4476	765	17·1
1960 ...	4596	662	14·4

More than two-thirds of the exports of Indian cloth consist of medium varieties. Nearly one-fifth consists of coarse varieties and the remainder of fine and superfine varieties. Indigenous raw cotton is used for the manufacture of coarse and medium varieties. This is an advantage on the side of India as against U.K. and Japan which have to import raw cotton of all types.

In 1950, India was the largest exporter of cotton textiles followed by Japan, U.K. and U.S.A. Subsequently, however, because of competition abroad and the increasing demand at

home the exports of cotton textiles from India could not be maintained at so high a level. The main competitors of Indian cotton industry in the world markets are the U.K., Japan and U.S.A. In Asia, India's formidable competitor is Japan. In Africa, the main competition arises from U.K. The share of the different countries in the export of cotton cloth is as follows:

WORLD EXPORTS OF COTTON CLOTH
('000 metric tons)

	1957	1958	1959
India	100	69	72
Japan	147	128	128
U.S.A.	69	63	59
U.K. . ..	57	48	42
France	33	33	42
Total* ...	656	585	600

It has been envisaged that the export target in 1965-66 will be 850 million yards for which the Government has already introduced the export incentive schemes in 1958 and the scheme for compulsory exports in 1962. All the same, there are difficulties to achieve the target.

If India is to compete successfully in the foreign markets with Japan and U.K., the productive efficiency of the industry will have to be raised. Her cotton piece goods will have to be competitive both in prices and quality. Both the reduction in costs and improvement in quality which are of considerable significance for the export market can be achieved through rationalisation. Many mills are of small size and cannot be considered as economic units. About 40 p.c. of the mills are of economic size. Uneconomic units are mostly in West Bengal and Madras. An economic size of mill should have atleast 25,000 spindles and 600 looms. It will be difficult for many mills, therefore, to survive for long, unless, these are made economic units. Then again, machines and implements in many mills are old and obsolete, which need replacement immediately. Only about 8 per cent of the total looms in India are automatic

* Represents 80 p.c. of the world trade.

compared to 67 p.c. in Japan, 60 p.c. in Pakistan, 43 p.c. in Europe and 15 p.c. in U.K. Because of larger percentage of automatic looms, Japan and Pakistan are in a better position in the competitive markets than U.K. and India. In very recent years, however, several units in India have brought about modernisation of equipment from loans obtained through the National Industrial Development Corporation. Automatic looms and various other machines like Barber Colman winding and warping machines, sizing machines etc. have been installed. It may be noted that several centres like Ahmedabad, Bombay, Calcutta and Coimbatore have developed engineering industries for the production of machinery. In the near future, the problem of replacement of machinery may not involve foreign exchange.

India has already captured the cotton markets of Iran, Arabia, Iraq, Aden, Australia, New Zealand, South Africa, etc. As these are essentially *price markets,* Indian cotton industry must try to reduce its cost of production, so that other countries may not drive out Indian cotton goods from these markets. The competitive strength of Indian cotton industry has been affected adversely to a certain extent because of the export duties on cotton goods. It has been estimated that domestic consumption of cotton textiles will increase to 8450 million yards in 1965-66 as against 7000 million yards in 1961. It has also been calculated that in the same year, 850 million yards will be exported. To meet the total target for cotton cloth of 9300 million yards, the mill sector will produce 5800 million yards and the handloom and khadi sector 3,500 million yards.

The Jute Mill Industry

The Indian jute industry is one of the biggest industries of the country and a prominent source of foreign exchange. The jute industry owes its development to British enterprise. Till 1828, the manufacture of gunny bags and cloth was in the hands of the Bengal peasant weavers and the production was very small. But after 1832 when it was found that jute might be used as a substitute for hemp as a result of the experiment carried out by a Dundee merchant, the demand for jute increased. In course of time, the bleaching and dyeing processes improved and

jute finally gained rapid popular favour. Thus the foundation of the jute-manufacturing industry was first laid in Dundee. Later in 1855, the first jute mill in India was erected at Rishra near Calcutta because of the efforts of an Englishman, George Auckland, by name.

Today, after cotton, jute is the most important industry in India. "In point of efficient organisation, the jute industry is perhaps second to none in India." The industry employs a daily average of nearly 310,000 workers. In 1958 the Indian Union had 72,288 looms which worked out to be 53 per cent of the world's total. Great Britain and France came next with 8 per cent and 6 per cent respectively. The jute mills in India, unlike those in Europe, are all integrated units and undertake both spinning and weaving.

Calcutta has the leadership in jute mill industry. Practically all the mills are in the neighbourhood of Calcutta on the banks of the Hooghly.

States	Mills	States	Mills
Bihar	3	Uttar Pradesh	3
		West Bengal	101
Andhra	4	Madhya Pradesh	1

The Bengal jute mills are of bigger size than those outside Bengal, partly because of proximity to growing areas and partly to the managerial integration.

There are certain geographical factors for the localisation of jute industry along the Hooghly basin within a radius of 40 miles of Calcutta. Since the jute mills industry aims at exporting its manufactures abroad, the question of accessibility to the port is a main consideration. The location of the jute mills along the Hooghly basin is such that the mills can bring raw materials with ease from the interior and can export their products readily through the port of Calcutta. Had the jute mill industry been mainly intended for home market, its location would have been near the sources of raw materials. West Bengal raw jute is brought partly by rail and partly by rivers. As Calcutta is a port, raw jute is also sent to this place for export. Thus supplies of jute are always available for mills. Coal is within easy reach of Calcutta and the distance of Rani-

gunj and Asansol coalfields is only about 120 miles. As a matter of fact, this proximity to the coalfields is a great advantage of Calcutta. Humid climate necessary for jute manufactures is also the characteristic of the Hooghly basin. Calcutta is an industrial centre and so there is a regular flow of labour from the neighbouring States of Bihar, Orissa and the Uttar Pradesh. At present more than 90 per cent of the labour employed in jute mills come from outside the State of West Bengal. Then again, the fact of Calcutta being a port makes the industry assured of supplies of imported machinery for mills.

The jute-mill workers are usually housed in dwellings provided by the mills at a nominal rent. These workers also enjoy free medical aid.

Calcutta itself is an important jute mill centre. The other centres are Bally, Agarpara, Rishra, Serampore, Shamnagar, Kankinara, Hooghly, Bansberia, Uluberia and Budge Budge—all in the Hooghly basin and also within 40 miles of Calcutta.

There are four jute mills in the Andhra State employing about 6,500 persons. Two of these are small units, the larger units being one in *Chitavalshah* and in *Nellimarlla*. These two big factories account for about 77 per cent of the total labour force employed in the jute mills in South India. Chitavalshah in the Bimlipatam taluk (Visakhapatnam district) is a jute village. Jute is grown in the vicinity but because of its poor quality it provides only a small percentage of what is used by the factory, the rest being obtained from other areas. The jute mill at Nellimarlla (Visakhapatnam district) employs about 2,000 workers.

In Uttar Pradesh there are 3 mills. Kanpur has two of these mills and employs 8,000 workers; the third is at Satyawa. The Indian jute mill industry consumes about 5 million bales of raw jute. Though the production of raw jute in India today is above 4 million bales, she has to depend for quality jute on Pakistan. At the time of partition, the Indian jute mill industry had to depend on Pakistan for more than 80 p.c. of raw jute. In 1960 India imported only 84,000 tons of raw jute. The target for raw jute production at the end of the Third Five Year Plan has been placed at 6·2 million bales.

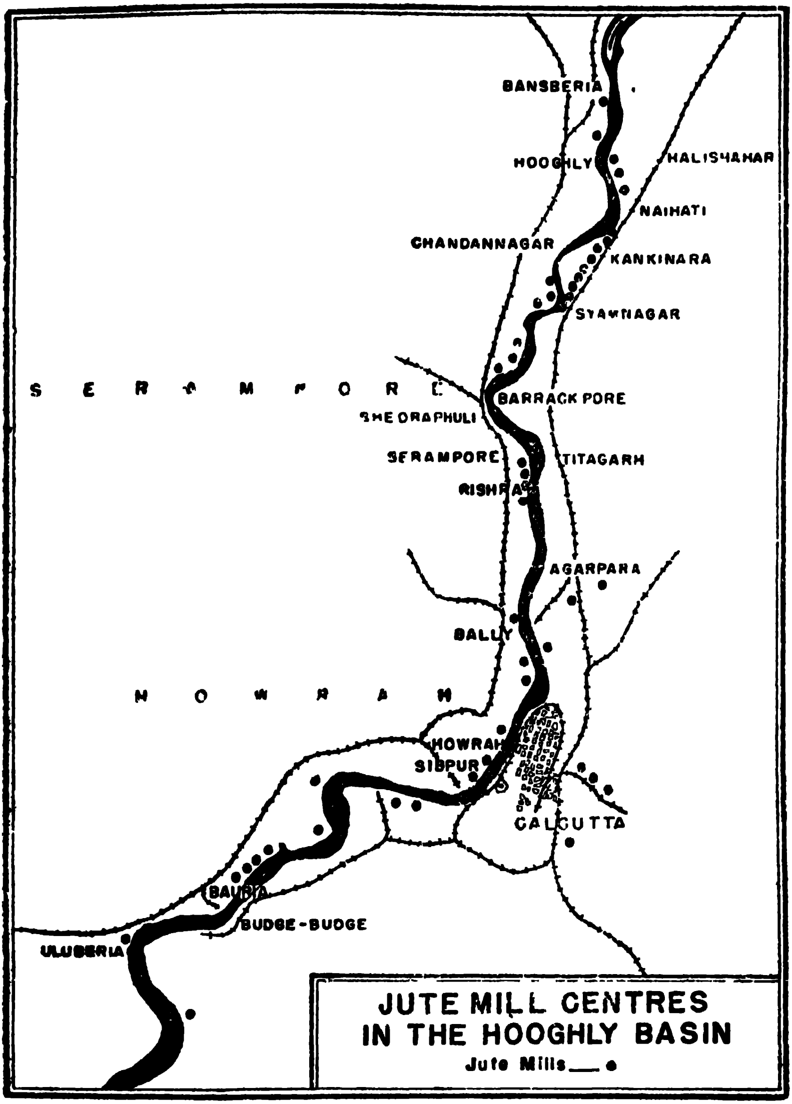


FIG. No. 50. All the jute mills of the Hooghly basin are within 40 miles of Calcutta.

India manufactures a little more than 1 million ton of jute goods. The capacity in 1965-66 will increase to 1·2 million tons.

Production of Jute Goods
(in 000 tons)

	Hessian	Sacking	Others	Total
1955 ...	401	575	51	1,027
1959 ...	458	503	89	1,052
1960 ...	422	541	104	1,067

Jute manufactures may be divided into four classes: (*a*) gunny bags or sackings, used for packing rice, wheat, sugar, oil-seeds, etc.; (*b*) gunny cloth or hessians; (*c*) coarse carpets and rugs.; and (*d*) cordage. Fine and clean jute yarn of uniform size and quality is used in the cable industry.

About 70 to 80 per cent of the manufactured jute is exported. In 1960, the volume of jute export was 771,000 tons out of the total production of 1,067,000 tons of jute goods. The internal consumption of jute goods has not increased very much except in the case of sacking. Internal consumption has gone up from an average of 130,000 tons before the plan period to 275,000 tons in 1962.

Utilization of Jute Goods
(000 tons)

	Hessian	Sacking	Others (yarns and rope)
Export:			
1955	376	457	16
1959	427	379	58
1960	383	317	71
1962	558	314	75
Internal Consumption:			
1955	25	122	22
1959	25	180	27
1960	33	209	25
1962	35	210	30

The main markets for sackings are Australia, Cuba, Indonesia, Burma, Thailand and U.K. With regard to jute cloth or hessian, about 50 p.c. of it go to U.S.A. The other buyers of hessian are Argentina, Canada and U.K.

Geographical Distribution of Shipments of Jute

(000 metric tons)

	1959	1960		1959	1960
U.K. ...	50	50	Canada ...	39	39
Europe ...	58	66	Argentina ...	54	38
Near East ...	12	10	Australia ...	72	74
Africa ...	82	83	New Zealand	15	17
Far East ...	130	97	Total of all Jute manufactures	860	810
U.S.A. ...	213	190			

India's position with regard to export of jute manufactures has not improved considerably from what it was before the Second World War.

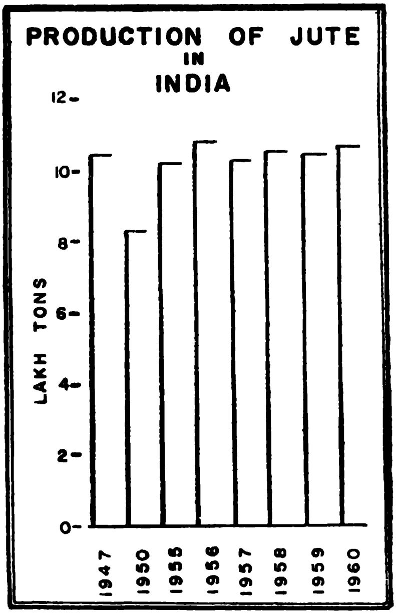


FIG. 51. The production consists of hessian, sacking and others.

As jute goods are made mostly for the world market, the industry is very sensitive to the general economic climate in foreign countries. The shortage of foreign exchange in some importing countries has had its adverse effect on India's export of jute. Then again, because of the steady growth of jute manufactures in many foreign countries, there are difficulties in increasing the volume of export. Some of India's buyers like Egypt, Iraq, Burma, Thailand, Philippines and China have set up new units for jute production. The most striking fact about the jute industry is that there has been comparatively little increase in the world consumption of jute goods during the past 25 years. The establishment of a jute mill industry in any country, therefore, means a threat to India's export of jute. Of late, Pakistan which has a rapidly developing jute industry has become a competitor of the Indian jute mill industry.

The high cost of raw jute is another problem of the Indian jute industry. The jute mills do not at present work to their full capacity. "The existence of a larger home demand would enable the industry to operate to its full capacity whenever there is a slackness in foreign demand, and thus enable it to reduce the cost of production. With increased agricultural production and greater demand for packing material, it would be possible to bring about an expansion in demand."

The United States of America is at present the best customer of India's manufactured jute goods. It takes about fifty per cent in volume of the annual exports of hessian cloth. In value it takes about thirty per cent of the total exports of jute manufactures of all kinds. U.K. is the next largest customer of hessian cloth but it takes only half of that of the U.S.A. Agrentina takes about ten per cent of the total exports of manufactured jute goods which include hessian cloth (ten per cent), hessian bags (thirty per cent), gunny bags, sacking cloth and sand bags. Australia takes a large quantity of sacking bags for wheat and wool. There is a considerable demand for twills in Egypt, the Levant, South America and South and West Africa.

The average value of the export of jute manufactures amounts to 20 p.c. of the total exports. From the point of view of foreign exchange earnings, jute occupies the first place.

	1959-60 (in Rs. crores)	1960-61	1961-6
Exports:			
Jute manufactures (including yarn) ...	109·8	135·1	144·8
Total exports ...	639·6	642·7	661·9

In recent years, the displacement of jute in many foreign countries has developed along two lines: (*a*) the use of grain elevators and other mechanical appliances for the bulk handling of grain in countries like Australia, Canada and Argentina; (*b*) the substitution of jute bags by bags of paper, cotton, sisal hemp and other fibres. During World War II, when jute export was interrupted by the hostilities, many substitutes like cloth and paper bags became popular as packing materials and captured a part of the market. In many countries these products still continue as competitors of jute. Most of the increase in

packaging demand in U.S.A. which is the most important market for hessian bags has gone to paper and bulk-handling methods. "Whereas production of paper in that country for making sacks and bags in 1959 had risen by about 340 per cent from the production level in 1939, there has virtually been no change in the figures for burlap consumption in that country from pre-war position." In U.K., France and West Germany, too, there has been growing demand for paper sacks in place of jute bags. Bulk handling methods are also coming into the markets for all types of packaging. It is quick, convenient and labour-saving process, although, due to the heavy initial costs there are little prospects for it to make large scale entrance into the markets of the less developed countries. These methods have nevertheless captured the packaging demand in the grain trade to such an extent that about 90 p.c. of the grain in the world markets is bulk-handled at ports. New Zealand has introduced *Phormium Tenax*—a vegetable fibre for domestic wool-packing industry; Russia and Argentina use *linseed fibre;* U.S.A., Sweden, South Africa and Australia widely use *cloth and paper bags.* "Competition from paper, synthetics and consumer packing has not yet become so severe in Canada although the bulk handling of grains is increasing". Canada takes about 95 p.c. of her jute goods from India.

The replacement of jute by processes of bulk handling is a permanent loss, but it is doubtful whether the substitutes of jute can compete with ultimate success. So long as the price of jute is kept within reasonable limits, there is no real possibility of its being ousted from the international market by the substitutes. Apart from jute's competitive cheapness, the jute bags have a resale value; they can be used time after time, and therefore in the long run are still cheaper. They can stand rough handling and bad weather and can be repaired quickly and returned to circulation.

Although markets may have been lost to competitive fabrics or in countries which are more and more tending to self-sufficiency, other new and valuable markets may be gained by research and experiment. The industry is carrying out diversification of production to meet the changing conditions among consuming countries. The output of jute goods other than hessian and sacking has increased considerably in recent years.

THE NEW LINES OF MANUFACTURE

Housing: Heat insulation; plastic furniture; carpets and curtains; upholstery; blankets; wall covering, etc.

Transport: Car upholstery; water-proof covers; tarpaulins; canvas; cordage and ropes.

Industry: Electric insulation; plastic reinforcement.

Clothes: Mercerized and bleached fibres blending with wool and cotton.

The problem before the jute industry is "to find continuing markets and new and increasing uses for its products." It is not that traditional items of jute goods are outmoded, but new products can always extend the range of jute exports.

A new demand for a special quality of wide hessian for use as a backing material of tufted carpet in the U.S.A. has encouraged the Indian jute industry to install more broad looms. Its production is now more than 5,000 tons a month.

The main drawback of the industry is, however, its obsolete machinery which, to a large extent, accounts for the high price of jute goods. To encourage modernisation of machinery in the jute mill industry, the Government has been liberal in granting licences for the import of modern machinery. The National Industrial Development Corporation has been helping the Indian jute mill industry to modernise its equipment by offering loans so that the industry can maintain the position of jute goods in the world market both against the jute manufactures of other countries and against substitutes. More than 60 per cent of the jute mills in India have modernised their equipment during the last few years, and it is expected that by 1965-66, the process of modernisation will be complete.

The Sugar Industry

India is the accredited birth place of sugar cane and sugar. The first mention of sugar is found in *Pratimoksha,* a code of behaviour prepared during the life time of Lord Buddha himself in 600 B.C. Its mention is also found in the records of Megasthenes who came to India from Greece in 300 B.C.* Even up to the latter part of the nineteenth century, India remained

* The art of sugar making had reached such a standard in India that the Chinese emperor Tai Tsung (627-650 A.D.) sent his men to India to study it.

an important exporter of sugar. From the beginning of the twentieth century the Indian Sugar Industry began to decline because of the competition of the Java Sugar Industry. Soon India became a big importer of foreign sugar.

The industry however received a greater impetus to revival with the grant of fiscal protection in 1932. From 29 factories in 1930, the number rose to 138 in 1937. Today, the industry is the second largest in India, next only to textiles. The industry employs about 150,000 skilled and unskilled workers.

The industry is mainly confined to north Uttar Pradesh and Bihar which might be regarded as the sugar-belt of India. The important sugar-manufacturing centres in these two States are Kanpur, Gorakhpur, Lucknow, Allahabad, Champaran, Muzaffarpur and Bhagalpur. Other sugar centres are Coimbatore in Madras, Belapur in Maharashtra and Amritsar in Punjab.

There are now 150 sugar factories in the country of which 72 factories are in U.P., 30 in Bihar, 16 in Madras and 15 in Maharashtra.

Production of sugar in India may be classified under three heads—(*a*) by modern factories working with cane, (*b*) by modern refineries working with *gur* and (*c*) by indigenous pan concerns which may be collectively called *Khandsaris*. Of these three methods of sugar manufacture, it is only the first that gives what may properly be called the white sugar of India, and it constitutes the most important section of the industry. The *gur*-refining industry as well as *Khandsari* industry are very inefficient and wasteful. More than 80 p.c. the sugarcane is used for the manufacture of *gur*.

SUGAR INDUSTRY: PRODUCTION

(In '000 lbs.)

Year		No. of mills	Production ('000 tons)	Import ('000 tons)
1950-51	...	138	1,100	55
1954-55	...	136	1,590	503
1955-56	...	142	1,800	Nil
1958-59	...	142	1,919	—
1959-60	...	150	2,215	—
1960-61	...	151	3,000	—
1961-62	...	151	2,700	—

Thus between 1951 and 1960, the production of sugar has increased by 200 per cent. To this must be added the production of Khandsari which is also on the increase. The industry which is managed by private enterprise has now made the country self-sufficient in respect of its sugar requirements. In fact, the export of sugar is desirable in view of the expanding production as well as the need for earning foreign exchange.

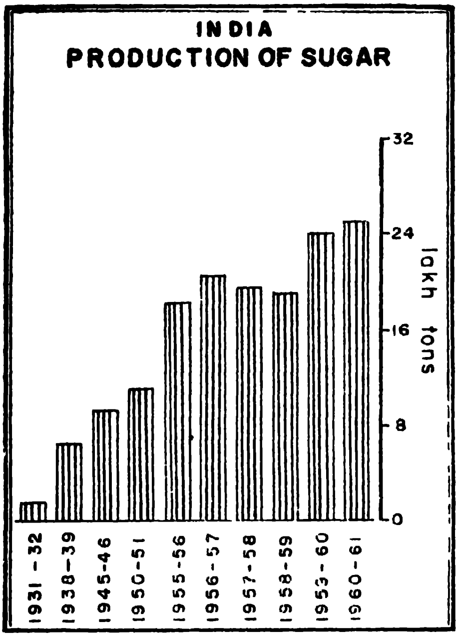


FIG. 52.

In spite of such remarkable progress, there are certain drawbacks in the industry. The present weakness of the Indian sugar industry lies in the high cost of production which results from the (*a*) seasonal character of the industry, (*b*) high prices of cane, (*c*) heavy rents for land, (*d*) high State taxation, (*e*) labour legislation, (*f*) great waste in refining, (*g*) poor output, and (*h*) the impossibility in most cases of concentrating cultivation round the central factory. The quality of cane is very poor in India and yet the cultivators are paid the same price as the Australian producers although the quality of cane in the latter country is much superior. Moreover, in India a sum per maund of sugar is being paid by way of Government taxes, while there are no taxes of any kind in Australia.

In Java the factories for turning the cane into sugar are near the plantations, and the process of manufacturing sugar is so developed that there is no loss of sucrose. Attention is also paid in Java to the production of by-products like rum and methylated spirit. The sugar factories of India have no

control over the sugarcane cultivation which is in the hands of ryots. These ryots possess small holdings of land and are not in a position to arrange for harvesting when the cane has reached maturity and is in the optimum condition. Moreover, in India sugar cane areas are generally found at a great distance from the factories: as a result, the factories have to depend for their supply of the raw material on remote areas and thus pay high costs. There are two other factors which need careful consideration. The number of days the industry works in a year varies from factory to factory as well as from region to region. The minimum duration for Northern Region factories is 83 days as against 112 days in the factories of Western Zone. Then again, recovery per cent of sugar from cane depends on the nature of crushers used.

The sugar industry has been responsible for the growth of a number of subsidiary and by-products industries in India. Apart from the fruit canning, the confectionery and the pharmaceuticals in which sugar is an important raw material, the by-products like bagasse, press-mud and molasses have many industrial uses. In the manufacture of paper, cardboard and insulation board, the use of bagasse is considerable. Press-mud is used in the making of carbon paper and shoe polish. Molasses have demand in the preparation of plastics, synthetic rubber, chemicals and power alcohol.

The per capita consumption is now about 30 lbs of which *gur* accounts for 20 lbs and sugar 10 lbs. The sugar market in India is extremely elastic. The present high price of sugar has kept the market confined mainly to the rich and the middle-class people. A little reduction in the price will bring the product within the financial capacity of the poor. The Indian Tariff Board has recommended as a means of lowering the cost of production of sugar and expanding the industry; (1) shifting of factories in the U.P. and Bihar to more suitable localities; (2) allocation of sufficient funds to the *Indian Sugar-cane Committee for carrying out its five-year plan of research and development and* (3) *fixation of sugar prices at a fair and reasonable level.*

On account of the increasing nature of domestic consumption, much sugar cannot be released for export. High price of Indian sugar is still a handicap in the matter of export.

Pakistan and other Middle-East countries normally decline to import Indian sugar as they get sugar from Cuba and Brazil at cheaper rates. Sugar-cane accounts for 60 to 70 per cent of cost of sugar. Sugar-cane cannot be cheaper unless there is more production of it, which can only be done by increasing the yield of cane per acre and also by improving the quality of cane.

The increased production and the consequent reduction in price will also help the industry to export the surplus production to Afghanistan, Tibet, Nepal, Burma, Ceylon and Pakistan. The European countries can also be supplied with Indian sugar now that India produces a superior quality and higher grade of sugar equal to that of Java.

The position of West Bengal in the production of sugar is at present not satisfactory. West Bengal is a large sugar-consuming area in India, but she has only four sugar factories. The present is, therefore, the most opportune time for starting more sugar mills. West Bengal enjoys certain natural and economic advantages for the cultivation of sugar-cane. In the U.P. and Bihar, the production of sugar-cane per acre is between 15 and 16 tons, while in West Bengal it is as much as 35 tons, sometimes 40 tons. The soil and climate of North-West Bengal and 24-Parganas are favourable to sugar-cane cultivation. West Bengal has also the advantage of a large local consuming market. Economy in railway freight charges on finished goods is also an additional advantage for her over the U.P. and Bihar. As regards availability of cheaper power West Bengal stands in a very favourable position in comparison with the U.P. A very large coal-field lies near at hand and her excellent railway system and riverways bring this source of mechanical power at a cheap cost to the doors of the mills.

The progress made in the manufacture of mill machinery in India and the expansion of sugar-cane output indicates a bright future for the sugar industry. About 35 million tons of sugar-cane a year will be available for sugar production during the Third Plan which will make it possible for the sugar industry to produce 3·5 million tons of sugar. This quantity will meet the demand in full and give a surplus for export. One interesting feature of the Third Plan will be the establishment of 25 new co-operative sugar factories.

Tea Plantations

India is the second largest tea-producing country in the world. About 80 per cent of Indian tea is obtained from Assam and West Bengal. Southern India raises nearly 18 per cent of the total output, the rest comes from Punjab and Bihar.

Though tea plantations are essentially large agricultural undertakings, they also have certain industrial characteristics with regard to labour, capital and organisation. The large labour force which they employ is mainly resident in the estates. The ownership is in the hand of the Joint Stock Companies and individuals—Indians and British.

There are more than 6,000 tea plantations in India, of which 50 per cent is confined to Punjab and 20 per cent to Assam. But the average size of a plantation in the Punjab is only 4 acres, whereas in Assam the average size exceeds 400 acres.

Distribution of Plantations

North India:		South India:	
Assam ...	784	Madras	
Bengal ...	302	Mysore	... 4059
Himachal Pradesh	226	Kerala	
Punjab ...	1126		
U.P. ...	46		
Tripura ...	55	Total India	... 6601
Bihar ...	4		

"Every garden of any importance has its own factories where tea is prepared for the market, as it is essential that the various processes should be carried through immediately after the leaf has been plucked. The better organised factories are elaborately equipped with highly specialised plant and are under the supervision of expert tea-makers."

The Indian tea industry employs more than a million labourers, recruited mostly from Uttar Pradesh, Bihar, Madhya Pradesh, Madras and Orissa. Assam employs in the tea-plantations more than half a million persons; in West Bengal

the number is a little above 300,000. The question of labour is a difficult problem in Assam, where the local labour is generally unwilling to work in the plantations, because it finds in the cultivation of land a more easy occupation. Labour is

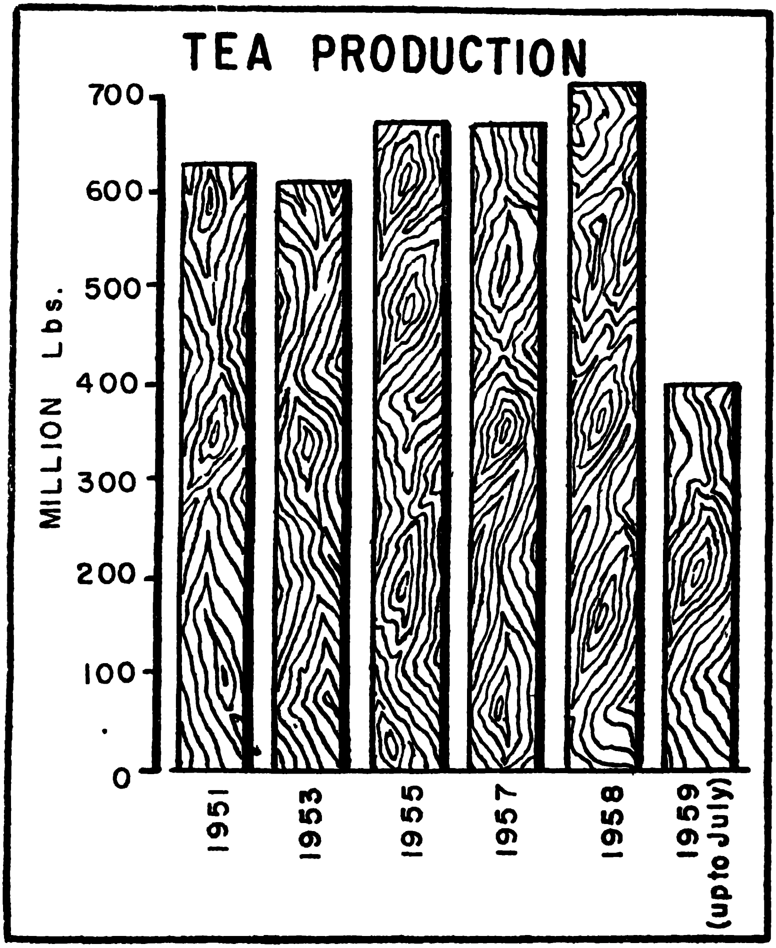


FIG. 53.

employed in Assam on a contract system—the workers agreeing to remain at a stretch for certain years in a garden. The workers in the field and the factory are interchangeable. It is also possible in a garden for all the members of a family to find work according to their physical capabilities.

In spite of the fact that the industry is based entirely on agricultural raw material and that there are competitors from African territories, its record of production has been very satisfactory. The tea estates in the north of the Brahmaputra in Assam, however, have certain problems. Apart from occasional earthquakes and floods, the great pressure on railways and river steamers for defence purposes caused by the Chinese incursion has dislocated the normal activity in the Assam valley tea estates.

PRODUCTION OF TEA IN INDIA (1958)

(In '000 lbs.)

Northern India		551,070	*South India*	157,733
Assam Valley ...	339,864		Annamalais	31,970
Dooars ...	134,307		Central Travancore	31,795
Darjeeling ..	16,694		Kanan Devans .	22,626
Cachar ..	43,370		Nilgiris ..	33,493
Others ..	17,835		Waynaad	13,081
			Others ..	24,778

Internal consumption of tea absorbs about 25 to 30 per cent of the production, while the rest is available for export. The U.K., Canada, Australia, Egypt, the U.S.A., France and New Zealand are the chief buyers. The U.K. is the single largest buyer and takes as much as 60 per cent of the export.* Although India is the greatest tea-exporting country in the world, several other countries, including Ceylon, Pakistan, Java, Indonesia, China, Japan and Indo-China produce tea and compete with India in European and Americar markets. The Indian tea industry contributes substantially to the finances of the Government of India. The collection of export duty from tea in 1957-58 was about Rs. 19 crores. During the same period, the total collection from the export duty of all commodities was Rs. 28 crores. The export duty on tea is a "good illustration of a duty which has been levied primarily for revenue." The total foreign exchange earning from tea in 1960-61 were Rs. 124 crores.

* The supply of tea to the United Kingdom was once monopolised by China, but in 1840 India and in 1876 Ceylon set out to break that monopoly and such success attended their efforts that in 1927 more than 83 p.c. of British needs of tea came from these two countries.

There is a great scope for the expansion of the market for Indian tea not only in foreign markets like Iran, Egypt and the U.S.S.R., but also in the internal market. *The Tea Board* is carrying on extensive propaganda throughout India, as a result of which the demand for tea has increased considerably. The Board claims that in Madras and Maharashtra more than 60 per cent of the former alcohol drinkers *have become regular visitors to the tea shops.*

SHARE OF TEA EXPORTS TO PRODUCTION
(in million kilograms)

	Product	Export	P.c. of export to production
1958 ...	360	254	71
1959 ...	360	236	65·6
1960 ...	312	160	51·3

The intensive advertising campaign initiated by the Board has already borne fruit in several countries; and apart from India and the United Kingdom itself, America, Egypt and Canada offer excellent opportunities as potential markets.

There has been a large increase in export of tea to Canada. U.S.A. and Australia from the Indian Union. In 1960 India exported 160 million kgs. of tea of which the U.K. took 60 per cent, U.S.A. 5 per cent, and Egypt 2 per cent. India's tea in U.S.A. accounts for about 25 to 27 p.c. of the total U.S.A. imports of tea. It will be noticed that the percentage of Indian tea is on the decline in total tea imports of many important buyers.

PERCENTAGE OF INDIAN TEA IMPORTS IN TOTAL TEA IMPORTS IN DIFFERENT COUNTRIES

	U.K.	Canada	U.S.A.	U.A.R
1956 ...	71	46	32	74
1959 ...	55	37	27	60
1960 ...	51	35	23	70

India's competitors are Ceylon, Indonesia, Formasa and East Africa. "The Indian tea prices are higher than her competitors. As the U.S.A. consumers are not quality conscious, price

plays a very important role in their market. Because of higher incidence of labour cost, India's cost of production of tea is also high." Thus in spite of a higher export duty, Ceylonese tea has gained further ground in this market. In addition, India's basis of levying export duty is such that it changes often and makes it difficult for American importers to calculate the final cost of landed tea. *As tea is a good dollar earner, it is necessary to give immediate attention to this problem.*

The present problems of the Indian tea industry are (*a*) the acute shortage of chemical fertilizers, (*b*) shortage of plywood tea chests and (*c*) the deterioration in the quality of tea. Further progress of the tea industry will depend on the solution of these problems. It is also necessary to make more propaganda for Indian tea in foreign markets.

As Calcutta is the main centre through which Bengal and Assam tea is exported, the partition of the country gave rise to problems in regard to transport resulting in high costs.* Calcutta's railway link with the tea-gardens of Darjeeling and Assam ran through Pakistan territory and coal-supplies had to be sent through a new route involving motor transport over difficult hill roads. This increased the cost of manufacture. Now there is a direct railway link between West Bengal and Assam through Bihar. But this route is not free from defects. The numerous rivers over which the railway bridges have been constructed, give rie to floods and interrupt traffic for fairly long periods. This has been happening in successive years since the line was completed. As these interruptions take place in the rainy season which is also the tea season, the storage difficulties become acute.

South Indian Tea has become popular in North India on account of its colour and flavour. Its movement to consuming areas is affected frequently by the shortage of railway wagons.

The target of additional production of tea during 1961-66 is 175 million lbs which, if achieved, will give an annual pro-

* More than 90 p.c. of the produce from Assam Valley and Cachar is carried to Calcutta by rivers and the rest by rail. About 60 p.c. of the produce of the Siliguri, Jalpaiguri and Darjeeling areas is carried by rail to Calcutta and the rest by river. About 450 to 500 million lbs. of tea are transported to Calcutta by these routes. After Dhubri in Assam, the rest of the river route from Assam Valley is through Pakistan ; so also the route from Cachar.

duction of 900 million lbs. after 1965-66, a volume sufficient for the growing internal market and for export.

The Sericulture Industry

The Indian silk industry was once in a very flourishing condition. During the sixteenth and seventeenth centuries, India, and more especially Bengal, occupied an important place in silk production and trade. The industry declined as the result of the competition of the silk yarn and silk piece-goods from Italy and Japan. In more recent years foreign silk and artificial silk manufactures have been competing with the silk-weaving and spinning industry in India.

India is a great raw silk producer. Various silkworms are reared in different parts of the country. The varieties are the mulberry silk, *tasar* silk, *endi* and *muga*. Apart from the availability of the four different types of silk, India's density of population, climate and economic conditions as well as ample demand for raw silk hold out a good future for the sericulture in India.

There are three principal areas where raw silk is found: (*i*) Southern portion of the Mysore plateau with the Coimbatore district of Madras, (*ii*) the Murshidabad, Malda and Birbhum districts of West Bengal, (*iii*) Kashmir and Jammu with the neighbouring districts of Punjab. There is also a considerable cultivation in Chotanagpur and Orissa and parts of the Madhya Pradesh of the *tasar* silkworm and in Assam of the *endi* and *muga* silkworm. *Tasar* silk is also obtained from North Bihar. Kashmir is the most important producer of silk in India where silkworms thrive best in the mulberry trees.

The silk industry of India is an important national asset with strongly marked characteristics. It consists of two well-defined sections:

(1) The production of cocoons; and
(2) the production of raw silk, including the utilization of by-products.

The first one is essentially a village industry, and the second is a factory industry. Sericulture as a village industry affords employment to more than 28 lakh persons in villages. The

handloom weavers consume 90 per cent of the raw silk available in the country.

Of the total production of raw silk in India, about 75 per cent is mulberry silk, and the rest consists of tasar, endi and muga. The mulberry silk producing areas are West Bengal, Mysore, Kashmir and Madras. In 1960, the production of mulberry and non-mulberry silk in India was 3·6 million lbs. It is envisaged that this production will increase to 5 million lbs. in 1965-66.

The demand for raw silk is in the neighbourhood of 1·8 million kgms. The bulk of the raw silk produced in India is consumed by the handloom-weaving industry. Although there are 90 silk factories in the Indian Union, only a few mills use power-driven looms for silk-manufactures—in Bengal, Mysore and Bombay.

The chief silk-weaving centres are Amritsar and Jullundhur in Punjab; Banaras, Mirzapur and Shahjahanpur in the U.P.; Murshidabad, Bankura and Bishnupur in West Bengal; Bhagalpur in Bihar; Ahmedabad in Gujarat; Poona, Nagpur and Sholapur in Maharashtra; Bangalore, in Mysore State; Berhampur in Orissa; Salem and Tanjore in Madras; Srinagar in Kashmir.

The Mysore silk industry produces more than two-fifths of the total output of silk manufactures in India.

The different districts of West Bengal specialise in manufacturing typical varieties of silk fabrics. *Sonamukhi* in Bankura and *Islampur* in Murshidabad make shirtings of various designs while *Bishnupur* in Bankura and *Mirzapur* in Murshidabad specialise in dhoties and saries. The Bengalee weavers buy both foreign and Indian silk. The foreign sources are Italy, Japan, France, U.S.A. and U.K.

The main problems of the Indian silk industry are the high cost and poor quality of raw silk. Since the cost of mulberry constitutes 60 per cent of the cost of raw silk, efforts are being taken to increase the yield per acre of mulberry. At present only a small proportion of the area under mulberry is irrigated. Besides, the cultivators often find other cash crops being more profitable. Mulberry cultivation can be a paying occupation if its yield per acre is increased with the help of irrigation and fertilisers. It is also necessary to see that mulberry seeds are

disease-free. Indian Silk is in demand in Ceylon, Singapore, Hong Kong, Malaya and East Africa. Of late, America and western countries have become good markets for Indian silk. The possibilities of increasing the export of silk will have to be explored by producing fabrics of oriental design, colour and pattern.

In 1960-61, India exported 590,000 metres of silk fabrics and earned Rs. 60 lakhs as foreign exchange.

The Central Silk Board set up in 1949 as a statutory body is taking measures for the improvement in quality from cultivation to reeling by way of research. West Bengal has a Sericulture research station at Berhampore for research in the improvement and development of the Sericulture industry and Cocoon production.

Rayon or artificial silk fabrics is produced from wood-pulp by forcing viscose through minute holes to form filaments which are cut into short length or staples which can be spun on ordinary cotton machinery after a little adjustment. It is the generic term for manufactured textile fibre or yarn produced chemically from cellulose.

The weaving of rayon fabrics started in India in 1931, because of the increasing demand for such fabrics in the country. The industry got excellent opportunities for expansion during the World War II when the imports of such fabrics were stopped. In the post-war period, tariff protection as well as import restriction gave further impetus for development. The weaving of rayon fabrics is concentrated in Maharashtra, Gujarat, West Bengal and Punjab. The centres are Bombay, Ahmedabad, Surat, Calcutta and Amritsar. There are also a number of small units in other parts of the country.

Although the weaving of rayon fabrics was started long before the second World War, there was no manufacture of rayon yarn in the country till 1946. The weaving industry was entirely dependent on outside sources—U.K., Japan, Italy and Switzerland. The first rayon factory to manufacture yarn was started in 1946 in Kerala. In fact, this was the first factory in the whole of south-east Asia. There are now five concerns in India which are engaged in the manufacture of yarn—one at Rayonpuram (Kerala), two at Bombay, one at Kotah in Rajas-

than and one at Hyderabad. India has now 35,000 power-looms and 75,000 handlooms for rayon manufacture.

RAYON INDUSTRY: RAYON AND STAPLE FIBRE
(in million lbs.)

	1950-51	1955-56	1960-61
Rayon Filament ...	0·4	16·	47
Staple Fibre ...	—	14	47

The Third Plan period envisages production capacity to 140 million lbs. of rayon filament and 75 million lbs. of staple fibre. "The overall target for rayon filament comprises 20 million lb. of tyre cord yarn for the automobile tyre industry, 76 million lb. of acetate yarn, 10 million lb. of synthetics and 10 million lb. of cuprammonium."

Rayon yarn can be manufactured in India from "fibro", a product obtained from grass and bamboo pulps. The forest wealth of Kerala and Mettur can be used for the manufacture of "fibro" with the help of cheap power obtained from the Pallivasal Hydro-electric Projects. Assam with her large wealth in the best quality bamboo is also an ideal region for setting up a rayon pulp factory. Moreover, in India large quantities of cotton and cotton waste are available and this can be used in the artificial silk industry. "The percentage of yield of artificial silk from cotton is far greater than that from wood-pulp; wood-pulp yields 30 per cent and cotton 85 per cent." The chemicals required are caustic soda, carbon disulphate, ammonium sulphate, white soap, bleaching liquid, etc., which are mostly available in India. As a plentiful supply of water free from chlorides is necessary, the industry should be localised on river banks having transport facilities.

There are about 300 mills in India for weaving rayon. In fact, the rayon industry has become second only to the cotton industry in importance. The future development of the industry will be influenced by the extent to which the production of long staple cotton is increased inasmuch as the staple fibre is regarded as a substitute for it.

Since the production of yarn falls short of demand, India

has to import about 23 million lbs. of rayon yarn and staple fibre yarn. In 1960-61, India spent more than Rs. 13 crores on yarn and thread of synthetic fibres and Rs. 67 lakhs on fabrics of synthetic fibres.

IMPORTS OF RAYON

	Rayon yarn (million lbs.)	Rayon piecegoods million yards)	Staple fibre (million lbs.)	Staple fibre yarn (million lbs.)
1954 ...	38	2	27	2
1957 ...	47	4	15	1
1958 ...	34	2	0·27	3
1960 ...	20	1	—	2

Apart from its two distinct advantages of durability and price over cotton, rayon has gained a considerable importance in the present emergency in the country as a wide variety of military requirements like parachutes and protective clothing are dependent on it.

The Woollen Industry. Indian wool is known in the world market as *East India Wools.* There are about 35 million sheep in India which are reared mostly in Northern India. The annual raw wool production is nearly 70 million lbs. Indian wool is short-stapled and is inferior to that of Europe and Australia. Raw wool is obtained from the Punjab, particularly the Hissar district, Garhwal, Almora and Nainital in the U.P. and Bikanir in Rajasthan. Owing to variations of climate and topographical conditions the production of wool varies widely in different parts of India. Where the land is undeveloped and climate suitable, *i.e.,* Rajasthan, sheep are kept in large flocks for wool production. In Bengal and Orissa, the industry is scarcely organised through the unfavourable climate which does not permit rearing of good wool-bearing sheep. In South India the sheep have degenerated to such an extent that they bear fibre which is more akin to hair than wool. The first woollen mills were set up about 1876 at Kanpur and Dhariwal because of availability of cheap labour and water supply. In 1960 there were 46 woollen factories with about 30,000 daily workers.

GEOGRAPHICAL DISTRIBUTION OF WOOLLEN MILLS

Region	Spinning	Spinning & Weaving	Tota
Maharashtra and Gujarat ...	2	7	9
Punjab	—	26	26
U.P.	—	4	4
West Bengal	—	1	1
Kashmir	—	1	1
Mysore	—	3	3
Madhva Pradesh	—	2	2
	2	44	46

Indian wool is suitable for the manufacture of carpets and blankets which are made at Amritsar, Srinagar, Bangalore, Jaipur, Agra, Mirzapore and Kanpur. Shawls are village industry products of Kashmir. The finest wool comes from Bikanir and is used in the mills. Modern mills are mostly localised in Dhariwal, Jamnagar, Gwalior and Kanpur.

PRODUCTION OF WOOLLEN MANUFACTURES

	1950-51	1955-56	1960-61
Woollen and Worsted yarn (in million yards) ...	18·3	21·7	28
Woollen cloth (in million yards) ...	—	15·0	15

The annual estimated capacity for woollen manufactures in India in 1960-61 was as follows: Woollen and worsted yarn 67 million lbs., woollen cloth 48 million lbs. and wool tops 10 million lbs. Thus it will be observed that the current production is much less than the estimated capacity. The gap between capacity and production is due to shortage of good quality raw wool, and uncertain market conditions. India imports annually 15 to 17 million lb of semi-processed wool. If proper care is taken to improve sheep-breeding and a better and cleaner type of wool is produced, the Indian Union can possibly become less dependent on foreign supplies. A number of breeding farms have been established for the production of superior rams. Measures are also being taken for correct shearing and systematic grading in Rajasthan.

The utilization of wool by Indian mills may be classified as follows:

(*a*) Indian plain wools—
  (*i*) Coarse types: Blankets and carpets.
  (*ii*) Finer types: Tweed, overcoatings, rugs, serge yarn.

(*b*) Hill types—low grade hosiery and army blankets.

(*c*) Cross-bred wools—Medium serge warps, worsted warps, tweeds, etc.

(*d*) Merino wools—Flannel, overcoating and superfine broadcloths.

			p.c.
Blankets	...	...	49·6
Modern mills	...	...	28·7
Carpets	...	...	11·6
Yarn for sale	...	...	6·8
Other uses	...	...	3·3

It is expected that the production in 1965-66 will be 52 million lb. in woollen and worsted yarn, 35 million yards in woollen cloth and 31 million lb. in Wool Tops.

A serious handicap from which the Indian woollen industry suffers is the fact that the season for wearing woollen clothes in India is about 4 months in a year, and the mills have to manufacture for many months in anticipation of a demand which may not be realised. The present state of emergency in the country has given a great impetus to the woollen industry because there is a considerable demand for woollen goods for use by defence forces at high altitudes.

The woollen manufacturers of India have formed a Federation to avoid rivalry and competition among themselves. This federation is known as the Federation of Woollen Manufacturers in India.

EXPORT TRADE IN WOOL

		1959-60	1960-61
Raw Wool (M. Kg)	...	19	12
Carpets & Rugs ... (000 sq. met)	...	1738	1560
Other Woollen goods (in Rs. lakhs)	...	70	59

In 1960-61, the export of wool contributed Rs. 12 crores in foreign exchange, as against Rs. 9 crores as cost of imported wool.

Indian manufactured woollens in the shape of carpets, rugs, piece-goods and shwals are exported to U.K., U.S.A., Canada and Australia. One important problem that confronts the export industry is that the quality of wool that is being sent outside is not properly graded. This has had an adverse effect on the export trade in as much as all products except shawls are showing decline in demand.

The Iron and Steel Industry

The iron and steel industry in India has become within recent years one of the biggest industries in India. India is the second leading iron and steel producing country in the Common-

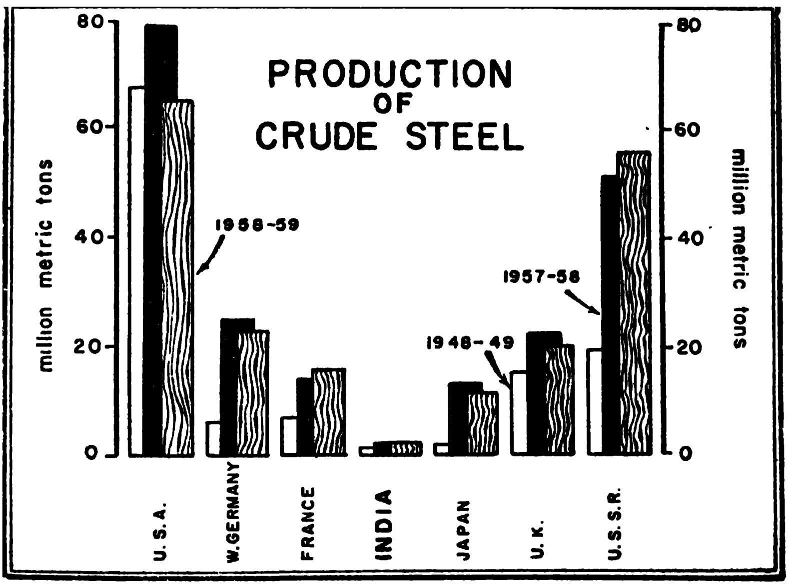


FIG. 54. India *vis a vis* the World Production in Crude Steel.

wealth of Nations and yields place only to the United Kingdom. Although her output of iron ore cannot be compared with those of the U.S.A., France, or U.S.S.R., her reserves of ore are so vast that there is every hope that India will eventually take an important place among the producers of iron

goods. India had a fine tradition in iron and steel evidence of which is available in the iron pillar of Kutub Minar (Delhi) dating back to 1600 years and in the iron beams of Konarak

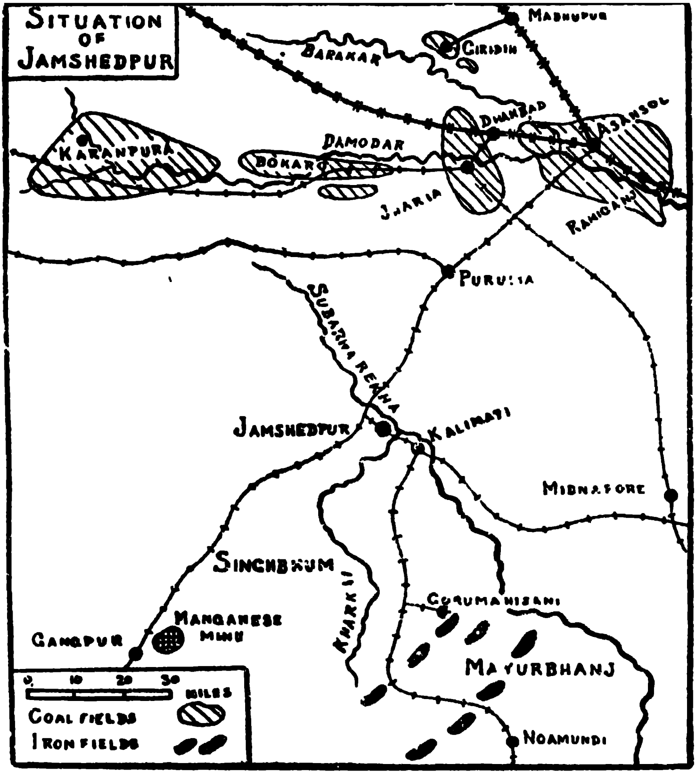


FIG. 55. The location of Jamshedpur with its source of raw material supply. Notice the coalfields of the north and the iron-fields in the south-east of Jamshedpur.

Temple (Orissa). Despite ancient tradition and the rich deposits of raw materials, the steel production in India along modern lines did not take place till 1908 when the Tata Company was established at Sakchi (now known as Jamshedpur) in Bihar*

* As far as is known, the credit for the first attempt to manufacture steel along modern lines in India goes to Madras where in 1830 one Josiah Marshall Heath with the financial assistance of the East India Company started the manufacture of iron on a large scale at Porto Novo in South Arcot. The Company, however, failed in 1874 for want of adequate equipment and fuel. Another successful attempt was made in 1874 at Barakar on the Jharia coalfields. The production was about 35,000 tons in 1900.

The expansion in the production of iron and steel in India in recent years has been due to the impetus provided by two main factors. First, India has realised that steel is a basic necessity for industrialisation without which economy cannot stand. Secondly, its development will help to save more than Rs. 100 crores a year in respect of foreign exchange.

The location of an integrated iron and steel plant is determined by nearness to iron ore and coking coal. It is interesting to note that "to produce 1 million tons of crude steel, about two million tons of iron ore, about $1\frac{3}{4}$ million tons of coal, $\frac{1}{2}$ million tons of limestone and about $\frac{1}{2}$ million tons of other materials like dolomite, manganese ore and alloy elements are required."

An integrated steel plant has four sections: (*a*) coke oven to convert coal into coke; (*b*) blast furnaces to smelt iron ore to iron; (*c*) steel melting plant to alloy iron with carbon and other metals to form steel; and (*d*) rolling mills to roll the steel into saleable products. In India the various other metallic ores required in extracting iron from the ore are also available in abundance not far from iron deposits. Again, dolomite and limestone are found within a short distance of the ore-fields.

At present, there are six integrated iron and steel centres in India—three in the private sector and three in the public sector. The centres in the private sector are Jamshedpur, Burnpur and Bhadravati. As regards the public sector, the steel plant units are located at Bhilai (Madhya Pradesh), Durgapur (West Bengal), and Rourkela (Orissa). Two new plants are being established—one at Bokaro (Bihar) and the other at Neiveli in South Arcot (Madras).

Jamshedpur, the centre of the Tata Iron and Steel Company, is the principal seat for the manufacture of steel in India. It owns valuable iron-ore concessions at Gurumahisani, only 50 miles away. Iron ore is also brought from Salaipat, Badampahar and Noamundi mines in Singhbhum. Coal is brought from the Jharia field, the distance being only 100 miles. Manganese is available in Malda, 30 miles south of Noamundi. Limestone and Dolomite are obtained from the neighbourhood, in Panposh on the Brahmi Valley in south-west Singhbhum. The centre is connected by railways and the cost of transportation is never high. Cheap labour is always available from

Madhya Pradesh and Chotanagpur. The river Subarnarekha, though useless for navigation, supplies water to the industry. During summer this river dries up and, therefore, arrangements have been made to preserve water in the Kharkai river by constructing a dam. About 45,000 people are employed in the steel industry of Tatanagar. The present steel production at Jamshedpur is a little over 1 million tons. Because of the completion of the modernisation and expansion programmes, the Tata Steel Works are in a position to produce 2 million tons of steel a year.

The Eastern Railway with its branch lines serves the industrial city for moving the raw materials and the finished products.

The Indian Iron and Steel Company was floated in 1918 to manufacture pig iron at Burnpur., Today *Burnpur* is the second largest iron and steel centre in India. The city is 142 miles from Calcutta and the industry is managed by the Indian Iron and Steel Corporation Ltd. In 1936 the Bengal Iron Co., Ltd., was amalgamated with it. The company also manufactures foundry iron for castings. The company has achieved a high level of production as will be seen from the following comparative figures:

IISCO PRODUCTION

('000 metric tons)

		1918	1960
Pig iron	..	415	1,187
Steel ingots	...	354	934
Saleable steel	..	297	737

In Mysore the iron-ore deposits exist in the Kemmangundi hills and in the Shimoga district The iron industry is localised at *Bhadravati*. Annually about 250 tons of steel castings for railways and various other industrial concerns are made at Bhadravati. The annual production capacity for steel ingots is about 100,000 tons. The forests of the Shimoga and Kadur districts supply charcoal for smelting iron ore. Limestone comes from Bhandigudda. Recently, the Mysore Works have

completed the cast iron spun pipe plant with a capacity of 17,000 tons per annum. A ferro-silicon plant of a capacity of 20,000 tons per annum is also being installed.

During 1956-61 construction of three steel plants under State management were erected at Rourkela, Bhilai and Durgapur. The Bhilai plant which is located in the district of Drug in Madhya Pradesh is destined to play a very important part in the national development of our country. Drug area is noted for iron-ore deposits—particularly the *Dalli Rajhara* range of hills, 20 miles south of Bhilai. Iron ore is also found in the adjacent areas of Hahaladdi, Kondapukha, Chargaon and Rowghat. The quality of iron ore is everywhere high, and the deposits from Drug, Chanda and Bastar exceed, 1,650 million tons. About 140 miles to the west of Bhilai, semi-metallurgical coal to the extent of about 66 million tons is available. Besides, large reserves of blending and other coal (approximately 260 260 million tons) exist at Korba. Limestone, another important raw material in the production of steel, is found almost at site. Limestone deposits in the four districts of Chhatisgarh cover an area of more than 15,000 sq. miles and can be traced along the railway line from Muripur railway station in Drug district to beyond Raigarh in the extreme east. Flux grade dolomite has been met with at Bhanewar, Kasondi, Parsoda, Kharia, Ramtola and Hardi in Bilaspur district and Bhatpara and Patpar in Raipur district. The quantity of water required in the steel plant is being supplied from the existing Tandula tank which will be further reinforced by the Gondli Project now under construction. The Bhilai Steel works commenced production of pig iron from February 1959. There will be six open hearth furnaces of 250 ton capacity each, producing one million tons of ingots annually. The plant has been so designed that the production can be increased to 2·5 million tons a year by 1965-66. Another factor in favour of the location at Bhilai is the proximity to the markets of Madhya Pradesh and Western India.

The main finished products of the Bhilai steel plant are rails and heavy structurals, merchant products and pig iron. The various by-products include ammonium sulphate, tar, benzol, benzene, xylene, toulene and napthalene. In 1961, the production was as follows: pig iron 8·6 lakh tons; steel ingots 6 lakh tons; blooms 5·5 lakh tons; billets 3·4 lakh tons; struc-

turals 48,000 tons; rails 73,000 tons and merchant bars 99,000 tons.

The second plant is established at Durgapur in West Bengal. It is equipped to produce light and medium sections of steel and billets. For the supply of iron ore to Durgapur, the mines in the Bolani region of Orissa are worked. The site has certain advantages like nearness to coalfields of Raniganj and Jharia and the excellent transport connections with Calcutta. Durgapur will have the capacity to produce 1·6 million tons of steel ingots and 0·3 million tons of pig iron.

In 1961 upto Nov., Durgapur plant produced about 3 lakh tons of pig iron and 69,000 tons of finished steel.

The third steel plant in the public sector is at *Rourkela* in

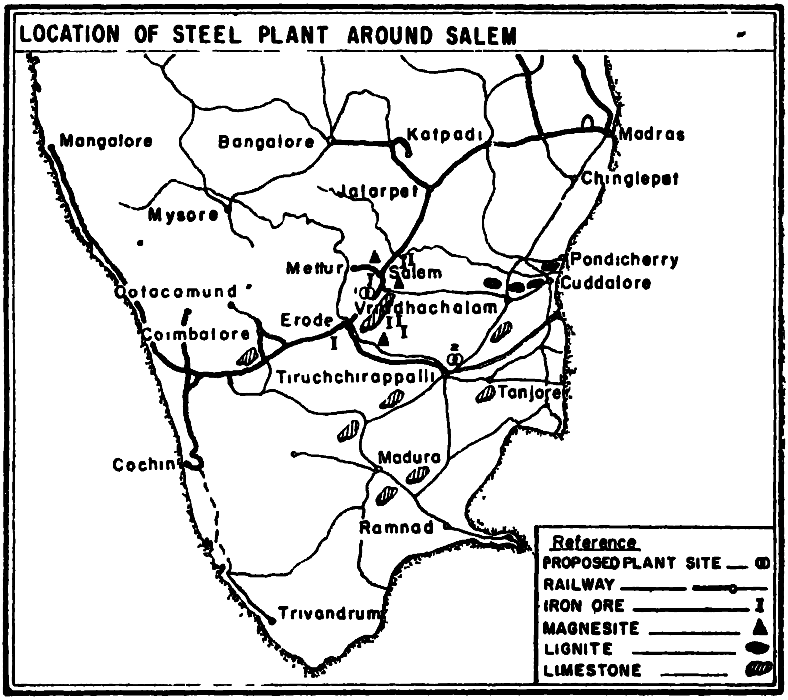


FIG. 56.

Orissa which has been developed with the German combine of Krupps Demag. A dam is being built across the river Sankh

to ensure adequate supply of water to the steel works throughout the year. A railway line is under construction from Rourkela to Dumaro. "The plant is ore-based: the site is in proximity to good quality iron ore in the Bonai ore range, 50 miles away. Limestone, dolomite and manganese are within easy reach." It is the only plant of its kind in the country to manufacture exclusively flat products. From April 1960 to November 1961, Rourkela produced 1 million tons of pig iron, 405,000 tons of steel ingots, 250,000 tons of slabs, 73,000 tons of plates, 62,000 tons of strips and 23,000 tons of pipes and 5,000 tons of cold rolled sheets. The capacity of the plant will be increased to 1·8 million tons of ingot steel per annum during the third plan period. The management of steel plants at Durgapur, Bhilai and Rourkela is with the Hindusthan Steel Limited which is owned entirely by the Government of India. Bokaro has the geographical advantage of being near to Kargali, Bokaro and Jharia coalfields. Though iron ore will be a little far away, "the coal empties from Rourkela and Bhilai will carry iron ore on their return journey".

The Government has programmes during the Third Plan for the production of steel to increase to 10 million tons per annum by 1965-66, to which the Hindusthan Steel will contribute 7 million tons.

The prospects of setting up an iron and steel industry in Madras also are bright. The State has got in the districts of Salem and Tiruchirapalli an almost inexhaustible reserve of low grade iron ore and limestone required for the industry. The deficiency of coal is, no doubt, an impediment, but then charcoal is available and also hydro-electric energy. It is estimated that the region has more than 300 million tons of iron-ore deposits, most of which contain 35 to 40 per cent iron. The auxiliary materials required for the iron and steel industry are fluxes and refractories. Both limestone and dolomite are available in Salem district itself, as also in Tiruchirapalli and Coimbatore districts, while refractories, fire clay, magnesite, chromite and siliceous materials are found near iron-ore deposits.

The Iron and Steel industry in India has developed a varied pattern of production including industrial machinery for industries like cotton, cement and sugar, railway rolling stock and components, structural fabrication, tin plate, sheets etc.

UTILIZATION OF IRON AND STEEL IN INDIA

	Capacity in 1961 (000 tons)	Estimated demand by 1965-66 (000 tons)
Heavy Rails and Fish plates	345	400
Heavy structurals ...	445	550
Sleepers	180	200
Medium & light structurals	680	550
Rounds and Flats ...	1305	2200
Tin plate	150	300
Plates	300	650
Sheets	740	1200
Total	4760	7300

The demand for steel in the country has so far been much more than the indigenous production. The shortfall between the production and the demand has been met by imports.

The primary difficulties of the iron and steel industry are inadequate transport, uncertainty in supplies and constant variations in the quality of raw materials. Despite all these difficulties, high levels of production have been achieved.

IRON AND STEEL PRODUCTION IN INDIA

	1950-51	1955-56	1960-61
Steel ingots ...	1·4	1·7	3·5
Finished steel ..	0·98	1·3	2·2
Pig iron for sale ...	0·35	0·38	0·9
Steel castings	—	—	0·05

The estimated demand for steel goods in 1965-66 will be about 7·3 million tons as against the demand for 4·7 million tons in 1961.

The existing capacity of Jamshedpur, Burnpur and Bhadrabati centres for steel ingots production is 3 million tons. The

steel plants in the public sector (excluding Neiveli) have a capacity for 7 million tons. The estimates of finished steel pro-

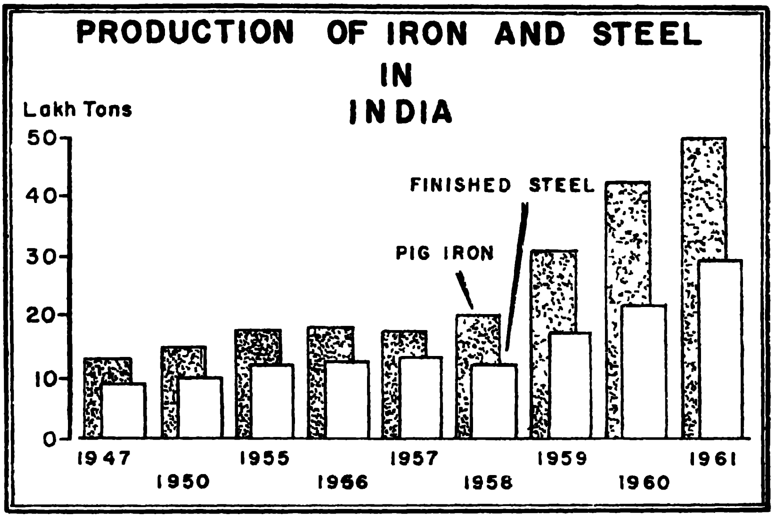


FIG. 57.

duction in the country during the Third Plan period is visualised as follows:

	Million tons
1961-62	3·5
1962-63	4·0
1963-64	4·3
1964-65	5·5
1965-66 . .	6·8

Even with her production of 6.8 million tons of steel in 1965-66, India will remain industrially far behind U.S.A., U.S.S.R., U.K. and West Germany whose present outputs are 120 million tons, 60 million tons, 25 million tons and 30 million tons respectively. It may be mentioned that for the expansion of steel production in India, the Government has adopted a two-fold policy—(*a*) helping the existing units, and (*b*) erecting new plants, the responsibility for which will be that of the State. "The State will be exclusively responsible except where, in the national interest, the State itself finds it necessary to secure the

co-operation of private enterprise, subject to such control and regulations as the Central Government may prescribe."

The size and rate of expansion of the iron and steel production in India is an indication of the expanding demand. The production is yet inadequate to satisfy the requirements of the different kinds of iron and steel goods. The demand will further increase because of the present emergency. The composition of steel goods which India imports from abroad is as follows:

IMPORT OF IRON AND STEEL

(in '000 tons)

		1959-60	1960-61
i.	Pig Iron	56	11
ii.	Iron or steel blooms, billets and slabs ...	113	36
iii.	Joists, girders, angles, round and squares	185	176
iv.	Plates and sheets ...	347	555
v.	Ry. Rails	127	176
vi.	Ry. tract construction accessories	75	89
	Total	1075	1325

In 1959-60 and 1960-61, the imports of steel goods cost India Rs. 85·2 crores and Rs. 120 crores respectively in foreign exchange.

India exports a large quantity of pig iron and steel manufactures. The bulk of the shipment goes from Calcutta. Madras also handles a considerable quantity. The chief markets for pig iron are the U.K., the U.S.A., Japan and China, while scrap iron and steel for re-manufacture go mainly to the U.K. and Japan. In 1960-61 India exported 11,000 tons of pig iron and earned Rs. 2·41 crores in foreign exchange.

The future outlook for the Indian iron and steel industry is bright. The immense natural resources of the country, particularly in comparison with those of some other eastern lands, its position of easy accessibility to the markets of the Indian and Pacific Oceans, the proved metallurgical skill of its iron masters and steel founders, and the commercial ability already displayed

in the development of the export trade in pig iron—these, together with the great potential and growing home market for steel goods of every description, all presage expansion.

"Of all the plans for increasing industrial output, the Indian plan for steel must surely rank the grandest . . If these hopes are fulfilled, Indian production at the beginning of the next decade will have multiplied nearly four times in six years. This is a faster growth than any which took place in Britain during the industrial revolution. The production of iron in England reached 1·5 million tons in 1840; it reached 6 million tons a year only during the 1870's."

ESTIMATES OF IRON AND STEEL PRODUCTION
(in million tons)
1965-66

	Capacity	Expected Production
Steel ingots	10·2	9·2
Finished steel	7·5	6·8
Pig iron for sale	1·5	1·5
Grey iron castings	1·2	1·2
Steel castings	0·20	0·20

Engineering Industries: In view of the development of metallurgical industries in India resulting in the increasing production of pig iron, steel and castings, steps are being taken to build engineering industries which will make available within the country a wide range of items like agricultural machinery, industrial machinery, constructional equipment, machine tools, heavy and light electrical equipment etc. Engineering industries can be divided into two groups:

(*a*) Mechanical Engineering industries

(*b*) Electrical Engineering industries.

The products of the Mechanical Engineering industries are machinery, structural fabrication, precision instruments, surgical instruments, railway rolling stock, tractors, automobiles and ancillaries, bicycles, sewing machines, rollers etc. The Electrical Engineering industries are concerned with products like electric cables and wires, electric fans, electric lamps, dry batteries, etc.

During the Third Plan period, there will be considerable expansion of capacity for grey iron castings, steel castings and steel forgings at Ranchi (Bihar), Durgapur (West Bengal), Bangalore (Mysore), Bhillai (M.P.), Rourkela (Orissa), and Chittaranjan.

Large-scale developments are proposed with regard to manufacture of industrial machinery which will be required for cotton textile, cement, sugar and paper factories. In addition, agricultural machinery, mining machinery and dairy machinery will receive emphasis. Some of the principal centres are Ranchi for heavy machinery, Durgapur for mining machinery, Bhopal for heavy electrical equipment, Bangalore and Ambernath (near Bombay) for machine tools. Chittaranjan is noted for railway rolling stock including electric locomotives. The other centres of activities are Lucknow for the production of precision instruments, Rupnarayanpur (West Bengal) for communication cables and Guindy (Madras) for surgical instruments.

Some major projects in the Third Plan:

1. Heavy electrical equipment near Roorkee in U.P. and Ramachandrapuram in Andhra Pradesh.
2. High Pressure boilers at Tiruchirapalli in Madras.
3. Machine Tools at Panjore in Punjab.
4. Heavy structurals near Nagpur.

Paper-Making in India

The manufacture of machine-made paper in India dates from 1867 when the first mill was established on the Hooghly. At present there are 18 mills in the Indian Union. The chief factors in the location of paper industry are (*a*) plentiful suppiles of soft water, (*b*) nearness to fuel supplies, (*c*) nearness to chemical supplies, (*d*) nearness to paper-consuming areas, and (*e*) nearness to a port on trade centre where wood-pulp and other grasses for pulp can be obtained.

Calcutta with its neighbourhood is the principal centre of the paper industry in the Indian Union. The other centres are Dalmianagar, Lucknow, Bombay, Punalur (Kerala), Saharanpore and Jagadhri.

GEOGRAPHICAL DISTRIBUTION OF PAPER MILLS (1960)

States	No. of mills	Centres
West Bengal	... 6	Kankinara, Titagarh, Raniganj, Naihati, Chandrahati, Calcutta.
Maharashtra	... 6	Bombay, Khopoli, Hadaspur.
Uttar Pradesh	... 2	Lucknow, Saharanpur.
Bihar	... 1	Dalmianagar.
Orissa	... 2	Brajrajnagar.
Punjab	... 3	Jagadhri (Ambala dist.), Faridabad (2).
Mysore	... 2	Bhadravati, Dandeli, Nanjangud.
Kerala	... 1	Punalur
Andhra	... 2	Rajamundri (East Godavari), Sirpur.
Gujarat	... 1	Barajadi.
Madhya Pradesh	... 2	

The Bengal mills are the largest in India and have an annual rated capacity of 105,000 tons out of India's total of 410,000 tons. The paper mills in West Bengal use bamboo and sabai grass for pulp. Sabai grass is obtained from M.P. and Berar while bamboo from Assam and the State itself. In 1959 the West Bengal paper mills employed about 18,000 workers.

In Maharashtra, the largest mill is at Khopoli. The mill at Bombay city produces card-board, etc. The annual rated capacity of the three factories in Bombay is 5,100 tons. The Bihar factory at Dalmianagar can produce 48,000 tons, a capacity second to Bengal mills only.

The Indian paper industry gives employment to more than 30,000 people. A basic requirement of the paper industry is the supply of suitable fibrous raw materials. At present *sabai grass* and *bamboo* are the principal raw materials for paper manufacture in India. Wood-pulp constitutes only 10 per cent of the total raw material. In India forests of coniferous trees—pine, spruce and fir—are available in the Himalayas, but it is not possible to exploit them commercially on account of the lack of transport facilities. There are possibilities, however, for using pine-wood of the Kashmir State for the manufacture of pulp. *Bagasse* is an important raw material for Indian paper

industry, inasmuch as its production exceeds 3·7 million tons a year. The main centres of bagasse are U.P. (2 million tons), Bihar (0·6 million tons), Maharashtra (0·3 million tons), Andhra Pradesh (0·2 million tons), and Punjab (0·15 million tons). Due to seasonal operation of the Sugar Industry, the availability to bagasse is not certain. Then again, the heavy use of bagasse as fuels by the sugar mills may not make it easily available to paper industry unless alternative fuel for the sugar industry is provided. Sabai grass, which grows abundantly in Northern India, is now used for making pulp in Punjab and U.P. For cheaper varieties, rag, hemp, jute waste and waste paper are used. There is considerable possibility of increasing the use of waste paper and rags as materials. "The utilization of waste paper in India is only 8 per cent against 30 p.c. in other countries." Bamboo pulp has been so far the mainstay of the paper industry and comprises about 70 per cent of the cellulosic raw materials used for the manufacture of paper. In spite of the abundance of bamboos and grass forests in the country, there are difficulties for the paper mills to obtain these raw materials. There is no centrally controlled and co-ordinated forest policy to ensure a regular supply of forest resources. The following measures have been suggested by the Planning Commission to solve the problem of raw material supplies to paper industry: (*a*) reservation of specific forest areas for the paper industry; (*b*) a rational method of price fixation on an all-India basis to enable the industry to obtain regular supplies of bamboos and

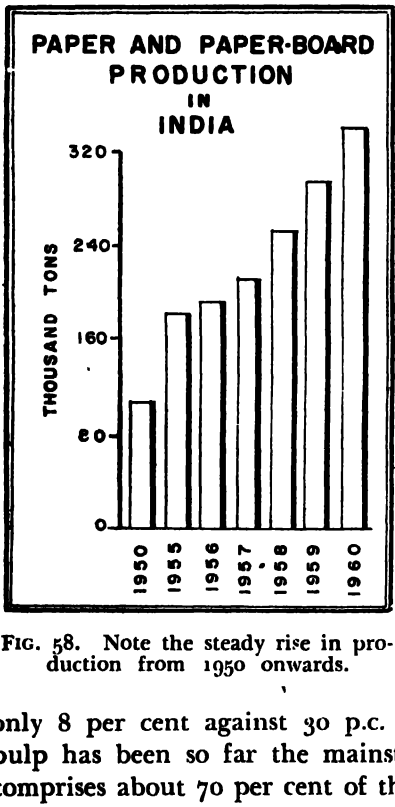


FIG. 58. Note the steady rise in production from 1950 onwards.

grass at reasonable prices; (*c*) development of roads in forest areas for facilitating transport. There can be no doubt that if the forest resources are exploited in a planned manner, the paper industry will be able not only to meet the requirements of the country but will also cater to the needs of the neighbouring countries.*

The supplies of bamboo in areas where the other conditions are favourable for its exploitation are sufficient to meet the needs of all the paper mills in India and leave a surplus from which an export trade in pulp can be developed. It grows extensively in Assam, Madras and Maharashtra. The advantage of bamboo is that the cutting rotation is on average four years as against 60 years in the case of wood. Further, the dead bamboo stems remain suitable for the manufacture of pulp for at least 4 years. Its yield is larger than sabai grass and cost cheaper. As a raw material, however, bamboo is inferior to sabai grass; but in India, the demand for superior quality paper is limited. The new industrial uses of bamboo for rayon grade pulp may, however, bring about a shortage of bamboo for the paper industry.

The paper industry of India is working under certain disadvantages. Much of the chemicals, like caustic soda, soda ash, salt cake, bleaching powder and dyes, are to be imported from abroad at high prices. In 1959-60, India spent Rs. 11 crores for the import of caustic soda and soda ash. Moreover, these chemicals are brought to the mill-centres from the ports, and the transport charges are heavy. The problem of power is no less acute. Most of the mills pay heavy charges for coal as the best coalfields are mostly confined to the Damodar basin of Bihar-Bengal.

The types of paper manufactured in India are white and unbleached printing, writing paper and envelopes, packing papers, pulp board, coloured printing other than newsprinting, badami, blotting and manilla. The following types of paper are still not manufactured in India: photographic base paper, foil paper, electrical insulation paper, glassine paper and brush coated art paper.

*The prospects of utilising *Salai wood* in the South, *Khargol* in Maharashtra, *ulla grass* in U.P. and *wattle wood* in Madras state for paper manufacture are bright.

Position of Paper and Paper Board Industry

	1950-51 ('000 tons)	1958-59 ('000 tons)	1960-61 ('000 tons)
Paper and Paper Board			
Annual rated capacity ...	136·6	400	410
Actual production ...	114·0	250	350
Newsprint			
Annual rated capacity ...	—	30	30
Actual production ...	--	22	25
Straw Board and other Boards			
Annual rated capacity ...	48·5	58·5	59
Actual production ...	22	22·6	24

A newsprint factory has been set up at Nepanagar in Madhya Pradesh in 1955 with an installed capacity of 30,000 tons. This factory, known as Nepa Mills, is in a position to manufacture newsprint from indigenous pulp woods and sabai mechanical pulp. The quality of the newsprint is not yet up to the standard of the imported newsprint. The cost of production is also high. The present internal demand for newsprint is about 70,000 tons a year. Other ideal places for the location of mills for the manufacture of newsprint are Kashmir and Tehri Garhwal were fir and spruce in sufficient quantities are available. A five-fold expansion from 30,000 tons to 150,000 tons in newsprint is being worked out by doubling the Nepa Mills and establishing new newsprint factories based on bagasse and soft woods available in the Himalayan region.

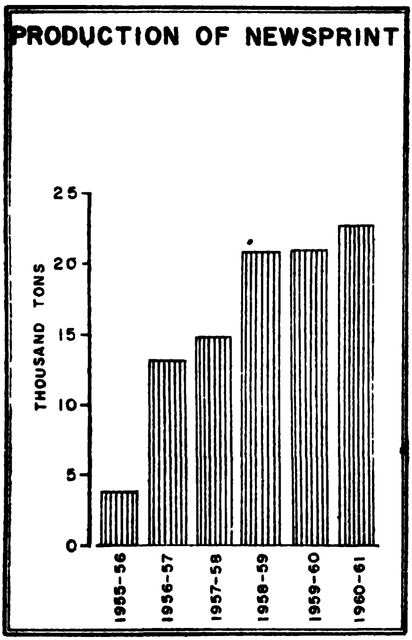


Fig. 59

Indeed, the expansion of newsprint industry in India is a vital national necessity. Experiments show that newsprint can be manufactured in India from the Indian spruce, paper mulberry and pula. Indian spruce occurs in the hills of Punjab, the U.P. and Kashmir. But owing to unwise fellings in the accessible areas, the wood is not available in regions where cost of extraction will prove to be economical. Paper mulberry species grows very fast and thrives in tropical climates. It attains to a pulp-wood size in 7 to 10 years of growth in natural course as against 60 to 70 years in the case of spruce and fir. Paper-making tests with this pulp were carried out by the Forests Research Institute of Dehra Dun and it was found that the strength characteristics of the newsprint were more or less as those of the sample of the imported newsprint.

Expansive rag papers, art paper, blue match paper, etc. are not likely to be made in India in near future. Recently, however, a mill for the production of tissue paper has been founded at Tribeni, Hooghly.

CONSUMPTION* OF PAPER & PAPER BOARD IN INDIA—1948-59
(EXCLUDING NEWSPRINT)

('000 tons)

Year	Printing & Writing Paper	Wrapping Paper	Paper Board	Other sorts	Total
1948 ..	81·92	25·33	22·48	16·75	146·48
1949 ..	89·06	27·26	34·17	18·10	169·09
1950 ...	83·66	19·95	22·29	14·76	140·36
1951 ...	89·12	35·80	28·95	11·38	185·28
1952 ..	103·76	31·03	26.45	7·94	169·18
1953 ...	118·33	33 26	23·46	6·98	182·03
1954 ...	120·25	36·27	27·18	8·83	192·53
1955† ...	141·46	40·75	43·27	29·87	255·35
1956† ...	141·51	50·01	41·71	33·18	266·41
1957† ...	145·00	50·37	46·44	11·40	253·21
1958† ...	161·02	39·54	52·77	11·54	264·86
1959 ...	181·93	61·67	58·01	8·95	310·56

Imports plus indigenous production.

Although the paper industry has increased its production considerably, the output is not yet adequate to meet the entire requirements of the country. The *per capita* consumption of paper in India is still very low with 2 lbs. per year compared to 400 lbs. in U.S.A. and 200 lbs. in European countries. Because of the spread of literacy, the consumption of paper in India, of late, has increased considerably. From 185,000 tons in 1951, the consumption has gone up to 391,000 tons in 1960. The targets for the Third Plan have been fixed at 700,000 tons of paper and paper boards and 120,000 tons of newsprint.

It is expected that Indian paper industry will soon supply the entire requirement of India and may be in a position to export paper outside. The possibilities of export are in the direction of Burma, Ceylon, Malaya and East Africa where at present there are no paper mills.

Chemical and Allied Industries

A well-developed chemical industry is essential for the economic well-being of a nation. India has more than 250 chemical factories providing employment for about 35,000 workers. The chemical industry has made enormous progress during the last few years. The range of manufactured products has greatly increased, and besides factories of basic products, raw materials for agriculture and industry, the Indian chemical industry manufactures many articles for direct consumption.

Chemical industry supplies materials which are used in other industries or agriculture. The production of soap, leather, glass, paints and varnish, drugs, rubber, etc., requires chemicals without which they cannot be manufactured

The chemical industry can be divided into:

(*a*) Heavy chemicals.

(*b*) Organic chemicals.

(*c*) Electro-chemicals.

The term 'heavy chemicals' refers to that section of the chemical industry "where chemicals are produced in large quantities, usually at low cost and which serve as raw materials or process agents." Heavy chemicals include mainly sulphur

and its compounds, acid hydrochloric, soda ash, caustic soda and fertilizers. The importance of heavy chemicals lies in the fact of their being essential for other industries like textiles, leather, paper, etc., and their consumption depends on the activity of those industries. The progress in the field of heavy chemicals has been very spectacular, and the country has already become self-sufficient in caustic soda, soda ash and sulphuric acid requirements.

PROGRESS ACHIEVED IN ACTUAL PRODUCTION OF HEAVY CHEMICALS IN INDIA

(in 000 tons)

	1950-51	1960-61	1961-62	1965-66 (Target)
Sulphuric Acid ...	99	363	430	1,500
Caustic Soda ...	15	125	125	530
Soda ash ..	11	148	185	340
Calcium Carbide ...	—	10	17	60
Sodium Hydro-sulphite ...	—	—	·6	10
Hydrogen Peroxide ...	—	—	1·2	8

The second World War was responsible for the birth of a heavy chemical industry in India. The curtailment of imports, the shortage of shipping facilities and the consequent demand for increased local production of different types of chemical goods provided ample cause for an accelarated tempo for the development of chemical industry. At present several types of heavy chemicals are manufactured in Bombay, Calcutta, Delhi, Kanpur, Amritsar, Madras and Bangalore, but the production is not sufficient to meet the requirements of the country. India's sources of raw materials for heavy chemicals are not deficient if only the various mineral ores are properly treated. Salt, limestone, gypsum, bauxite, zircon, ilmenite, beryl, monazite, kaolin, etc., are found in abundance. In regard to fuel, the problem is very serious, because cheap coal is not available in centres such as Delhi, Madras, Bombay and Bangalore; it is available only in Bengal. The hydro-electric

schemes which are being developed in the Punjab, Madras and Maharashtra will in a few years' time be able to supply cheap electric power.

There are 44 factories for the production of sulphuric acid with rated capacity of 476,000 tons. 13 factories are in Bengal and 12 in Bombay. In 1960-61 the sulphuric production was 363,000 tons. Caustic soda plants are located in Rishra (West Bengal), Mettur (Madras), Ahmedabad, Mithapur, Delhi and Dehri-on-Sone. The problem of sulphuric acid industry is the dependence for sulphur on foreign countries. The production of caustic soda in 1960-61 was 100,000 tons which was short by 388,000 tons to meet internal demand. Ammonium sulphate and superphosphates are the two fertilizers which are employed in agriculture. The need for developing the fertilizer industry in India was recognised as early as 1942 when a factory was started at Belagula in Mysore for the manufacture of ammonia and ammonia sulphate. In 1946, another factory was set up at Alwaye in Kerala. Today, the other centres of fertilizer production are Sindri, Nangal, Neiveli, Rourkela, and Trombay. Sindri plays a very important part in the country's economy by supplying chemical fertilizers for increasing the yields of crop and helping India to achieve self-sufficiency in foodgrains. The essential raw material for fertilizer industry is gypsum which is brought from Rajasthan involving a distance of 1,500 miles from Sindri. The important factor in deciding the location of the fertilizer industry at Sindri is the availability of cheap coal in the vicinity. It is probable that the production of nitrogenous fertilizers will be 1 million tons, of which about 730,000 tons will be produced in the public sector.

The consumption of fertilizers per acre of arable land is still very low in India, being only 2 lbs. compared to 209 lbs. in Japan and 402 lbs. in Netherlands.

The *organic chemical industry* in India has been a post-war development, greatly stimulated by the First and Second Plans. One of the most important factors for the expansion of chemical industry is the demand by various other industries for organics as raw materials. As yet oil has not become an important raw material for organic chemicals in India. Vegetable raw materials like cellulose, sugar and vegetable oils are being used as raw materials for rayon, cellulose acetate and polythene plastics,

synthetic rubber and paints. *Coal tar* is the foundation from which benzole, anthracene and anthracene oil are obtained for use in dyes, explosives, flavouring essences, perfumes, plastics, pharmaceutical and photographic chemicals. Coal tar production and its distillation are centralised in Calcutta, Kulti, Jamshedpur, Bombay, Jharia and Hirapur. Paints and varnishes are concentrated in Bombay and Calcutta. *The Electro-chemical industry* is of recent origin in India. Among the many products, the chief are calcium carbide, aluminium, magnesium and ferro-manganese. In many of these industries, electrical energy forms the major portion of the cost of the products, success or otherwise of the industry being largely dependent on the rate at which power is made available to the industry. The most important single factor in the development of electro-chemical industries in a country is the presence of cheap electric power. That is why the greatest development of this industry has taken place in countries where power resources are abundant. In India the scope for its development has been greatly restricted by the high cost of electric energy. The several multi-purpose projects which are under construction will in the near future improve the position. "With the availability of energy at economic rates in the near future and with the great variety of raw materials found in abundance in this country, there is an alluring prospect of new industries based on electro-chemical technology being started, and also for the improvement of those existing already in the country."

Drugs and pharmaceuticals have made great progress since 1948. The more common products are sulpha drugs, penicillin, streptomycin, D.D.T. etc. In 1955, a penicillin factory was set up at Pimpri near Poona. In sulpha drugs, too, substantial progress has been made in Bombay, Baroda and Calcutta. D.D.T. is manufactured at Delhi. Though not of considerable value, India exports medicinal and pharmaceutical products to Nepal, Pakistan, Burma and Malaya. In 1961, the value of export was 99 lakhs.

The Government is encouraging private investment in almost all sectors of the chemical industry. However, some of the schemes are too small to be viable, and the locations are leading to fragmentation with the result that the cost of production is substantially above world levels. The imposition of

excise duties on raw materials and intermediate products are also responsible for the high cost.

Glass and Ceramic Industries

Glass manufacture has been known in India since time immemorial. Crude glassware and ornaments have been found dating back to the early centuries A.D. In the 16th century there was an established glass industry in India which produced bangles and small bottles. The credit for the growth of glass industry on modern lines in India goes to the oldest factory at Bombay which was started in 1908 as a result of the Swadeshi movement. One Mr. A. D. Kale collected a few thousands from the masses with one pice from each contributor and started the Paisa Fund Glass Works at Telegaon with the help of certain political leaders.* But it assumed the character of a modern industry with the outbreak of the War of 1914-18, when Indian manufacturers made considerable efforts to fill the partial void created by the stoppage of imports from Czechoslovakia, Belgium, England and Germany. With the end of the war of 1914-18, the foreign competition reasserted itself. With a view to protecting the indigenous industry the Government imposed an import duty of 30 per cent on glass bangles and 15 per cent on glasswares. The duty was further increased in 1931. By 1932 there were 59 factories. Thereafter the number of factories continued to increase. The distribution of modern glass factories in the principal areas in 1959 was as follows:

Uttar Pradesh	24	Madhya Pradesh	5
West Bengal	30	Madras	9
Maharashtra	18	Delhi	3
Bihar	8	Mysore	2
Punjab	3	Total	123

The existing factories have an installed capacity of over 370,000 tons a year, though the actual production is about 250,000 tons. It is this low utilization of the installed capacity which accounts for inadequate supply.

* Report on the labour conditions in the glass industry by B. P. Adarkar (1949).

The industry is carried on under two systems: (*a*) the indigenous cottage industry, and (*b*) the modern factory industry.

The indigenous glass industry with 93 small factories is spread all over India, but the chief areas are the Firozabad district of the Uttar Pradesh and the Belgaum district of Maharashtra. Bangles are mostly made of Firozabad which supplies nearly one-third of the country's demand. So complete is the concentration of the bangle industry at Firozabad that practically no bangles other than the indigenous (*desi*) bangles of the village workers are made elsewhere in India. The industry is, however, decentralised at Firozabad and all the processes are carried on in shops employing 5 to 35 persons in each. The indigenous glass industry had to face competition from the factory industry which started manufacturing the rough type of bangles in competition. On top of this, the competition from Japanese manufactures in bangles and other ornamental types was vigorous. As a result, the indigenous glass industry

PRODUCTION OF GLASS & GLASSWARE IN INDIA FROM 1951 TO 1959

Year		SheetGlass (000 sq. ft.)	Laboratory Glassware (tons)	Glass Shells (Lakh) pieces	Other Glassware (tons)
1951	...	11,089·2	1,980	144·0	90,324
1952	...	9,043·2	1,476	166·8	85,368
1953	...	22,786·8	1,320	169·2	72,444
1954	.	33,112·8	1,512	221·4	85,188
1955	...	38,883·6	2,496	260·4	1,00,008
1956	...	47,629·2	3,360	327·6	1,13,532
1957	...	54,226·8	3,156	391·2	1,23,528
1958	...	73,858·8	3,672	402·4	1,46,796
1959	...	80,565·2	5,280*	388·0	1,57,308*

*From July 1959 onwards figures are in Metric Tons.

is today restricted to the rough products and is on a smaller scale.

The modern factory industry is more or less restricted to the production of the following classes of goods:

(1) Glass cakes for bangles.
(2) Beads, bottles, lampware, phials, table wares, etc.
(3) Sheets and plate glass.
(4) Surgical and Laboratory requirements in glass in special cases.

Uttar Pradesh, Bombay, and West Bengal are the three main states for glass factories.

The glass industry has developed to a considerable extent in Uttar Pradesh where 24 factories manufacture bangles, hollow and pressed wares, glass sheets etc. *Bahjoi* in the district of Moradabad is an important glass-sheet making centre in India. Two sheet glass factories are being set up at Tiruvottiyur and Sembium in Madras State. Between 1951 and 1959 the production of sheet glass has increased considerably from 10 million square feet of sheet glass to about 80 million square feet. Hollow and pressed wares like motor head-lights, reflectors, bulbs, chimneys, etc., are produced in Shikohabad, Hathras, Naini and Bahjoi. The factors that led to the success of the glass industry

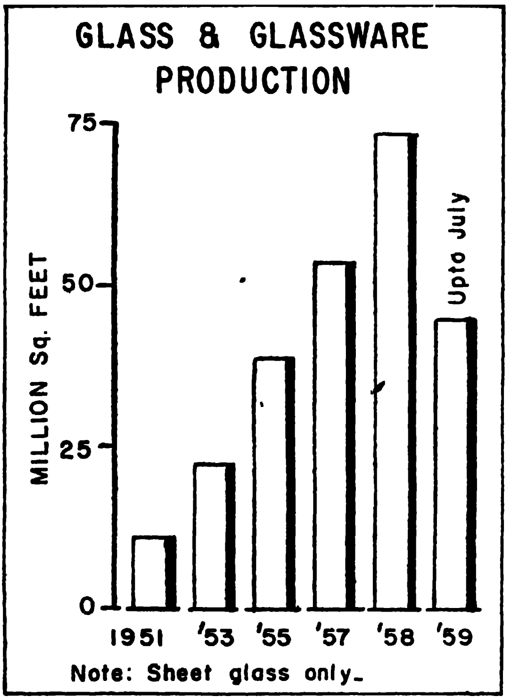


FIG: 60

are the availability of sand, potash, nitrate and lime in the state itself. Coal is imported from Bihar and West Bengal. There are, however, certain drawbacks in the glass industry of U.P. The designs of bangles and glasswares are all old-fashioned and are mostly imitations of the Japanese brands or Moradabad brasswares. The industry is in the hands of small dealers, and as such it is not properly organised.

Lamp wares, bottles, glass tubes, flasks, beakers, test tubes, plate glass, etc., are mostly made in Bengal and Maharashtra. There are 18 glass factories in Maharashtra, employing about 4,500 workers. In Punjab, the principal centre of industry is Amritsar with its four glass factories. These factories produce mostly bottles. There is also one factory at Ambala which produces both scientific goods and hollow wares.

The most commonly used raw materials are sand, borax, soda ash, salt cake, dolomite, limestone, saltpetre, sulphur, manganese dioxide and colouring materials. Sand which constitutes 70 per cent of the batch materials is available in the various parts of the country with varying quality. Borax is not found in India and has, therefore, to be imported from U.K. and U.S.A. There are abundant supplies of good quality dolomite, saltpetre and limestone in the country. The other raw materials like sulphur, manganese dioxide and colouring materials are imported. The main difficulty of the Indian glass industry today is the procurement of soda ash which is now partly imported and partly obtained from the Indian soda ash factories. Coal and fuel oil are used for glass smelting, choice being dependent on prices and availability in the neighbourhood. West Bengal, Bihar and U.P. use coal while oil is common in Maharashtra and Madras.

In spite of India's great progress in glass industry, the value of imported glass was Rs. 60 lakhs in 1959 as against the exports for Rs. 20 lakhs. Exports of glass and glassware are sent to Aden, Bahrein Island, Ceylon, Burma, Malaya, Arabia, Iran, Afghanistan, Indonesia and Indo-China.

The manufacture of optical and ophthalmic glass will be an important development in the Third Plan period. The centre for ophthalmic glass will be Durgapur in West Bengal, which is already an industrial centre of considerable importance.

The Third Plan targets are estimated at 620,000 tons, the item-wise figures being as follows:

Bottles and vials (ton)	280,000
Sheet glass (million sq. ft.)	200
Lampware (ton)	50,000
Thermos flasks (doz.)	320,000
Laboratory glass ware (ton) ...	21,500
Table-wares (ton)	115,000
Glass shell (million pieces) ...	110
Miscellaneous glassware including optical & ophthalmic	36 000

Ceramic Industry

Though of recent origin, there has been considerable progress of ceramic industry in India. There are now a little more than 50 ceramic factories for the production of white wares, sanitary wares, glazed tiles and high tension insulators. The important centres are Calcutta, Bombay, Bangalore, Madras, Delhi and Baroda.

Aluminium Industry

The aluminium industry was established in India in 1943. The two most important pre-requisites for the production of aluminium are bauxite and cheap electric power. India possesses large reserves of high grade bauxite suitable for the manufacture of aluminium. Deposits of bauxite are available in Madhya Pradesh, Orissa, Bihar, Madras, Maharashtra, Jammu and Kashmir. India possesses bauxite, the basic raw material for aluminium, to the extent of 250 million tons of which 25 million tons has already been proved to be suitable for the manufacture of aluminium. Cheap electric power is a very important factor in the production of aluminium. About 20 per cent of the cost of smelting is accounted for by electric power.

Aluminium has recently assumed great importance as a metal because of its lightness, corrosion-resistance, electrical conductivity and ease of fabrication. The metal is used in trans-

port, chemical, brewery and food industries, building and architecture, insulation and paints. The aircraft industry is entirely dependent on the use of aluminium alloys. The metal is also used for bus bodies and railway coaches. Aluminium vessels are much more suitable for use in the kitchen than those of other metals. Aluminium containers are also replacing containers of tin-plate. For India, the aluminium industry is one of supreme importance in view of the fact that aluminium is the only non-ferrous metal which is produced in large quantities within the country.

The aluminium industry is located at *Alwaye in Kerala, Belur and Asansol in West Bengal, Muri in Bihar, Hirakud in Madhya Pradesh, and Bombay.* Bauxite is mainly mined in the Lohardaga region of Bihar. The processing of bauxite ore to alumina is done at Muri in Bihar. Alipuram (Alwaye) in Kerala State is concerned with the electrolyte reduction of alumina to aluminium metal. The rolling of aluminium metal to sheets and circles is done at Belur in West Bengal. Bombay has started the manufacture of aluminium powder and paste. A new aluminium centre is being opened near Katni in Madhya Pradesh.

ALUMINIUM PRODUCTION

(in tons)

Year	Production	Consumption	Import
1951	3,840	15,000	10,500
1953	3,758	12,500	14,800
1955	7,273	27,000	15,800
1959	8,200	35,000	19,200
1961	18,000	46,000	23,000

The factory at Hirakud has a capacity to produce 10,000 tons per annum. Steps are being taken to popularise the industrial and other uses of this metal. Till 1950, about 90 per cent of the demand for this metal was for making utensils. It is envisaged that by the end of 1966 the production will be 86,000 tons. With the inauguration of three new projects at Salem (Madras), Koyna (Maharashtra) and Rihand (U.P.) and the expansion at Hirakud and Asansol plants the total installed capacity is expected to

increase to 83,100 tons by the end of 1963. For the Third Five Year Plan the target for aluminium production has been fixed at 75,000 tons per annum.

As the present production meets only about one-third of the requirements, imports come mainly from Canada, U.K., U.S.A. and Norway which account for 90 per cent of the aluminium imports. In 1959-60 and 1960-61, the import of aluminium cost India Rs. 6 crores and Rs. 7·6 crores respectively.

As the main requirements of aluminium industry is a dependable source of electrical energy, the development of the industry is being hampered by the absence of adequate supplies of power at reasonable rates. Countries like Norway, Switzerland and Japan have established smelter capacities though they have no bauxite resources of their own. The progress of aluminium industry in the country would depend on cheap and abundant supplies of power and the facilities for transport of bauxite or alumina to the smelter sites.

For the production of one ton of aluminium, the following raw materials are required:—

Bauxite	—4 to 5 tons
Calcined petroleum coke for electrode paste	—0·5 ton
Cryolite	—0·1 ton
Aluminium fluoride	—·036 ton
Caustic soda	—0·1 ton
Electric energy	—20,000/24,000 KWH.

High grade bauxite containing over 50 per cent alumina occurs in Madhya Pradesh, Bihar, Maharashtra, Madras, Mysore, Orissa and Kashmir. After meeting the requirements of the aluminium industry, a little bauxite is exported to U.K., Japan and Pakistan. Indian aluminium industry, however, depends entirely on the import of cryolite and fluoride, though there are deposits of fluorspar in Rajasthan, Madhya Pradesh and Gujarat.

At present there are two companies in India which are producing aluminium—(*a*) the Indian Aluminium Company Ltd. and (*b*) the Aluminium Corporation of India. The first company owns bauxite mines in Lohardaga (Bihar). It has a

refining plant at Muri, reduction works at Alwaye and rolling mills at Belur and Hirakud. The second company has been an integrated industry at Asansol (West Bengal). It owns mines in Lohardaga (Bihar). If India's raw materials are properly exploited with power facilities there is no reason why aluminium industry will not develop in a big way especially when the demand is on the increase. Much will however depend upon the extent to which additional foreign exchange will be provided for the expansion of aluminium production.

Leather Industry

The main factors in the location of leather industry are the following: (*a*) plentiful supplies of hides and skins; (*b*) plentiful supplies of good water; (*c*) nearness to chemical supplies; and (*d*) good supplies of tanning materials.

Hides (the skins of the larger animals) and skins (the skins of the smaller animals) are the chief raw materials of leather industry. India is the world's major supplier of raw and half-tanned hides and skins. She produces annually about 16·2 million cow hides, 5·5 million buffalo hides, 23·2 million goat and 15·1 million sheep skins a year. With regard to hides and skins, the supply cannot be increased unlike mining and plantations. The availability is to be assured by proper collection and preservation. Also, the quantity of hides and skins depends upon the mortality rate. Because of the absence of a sufficient number of slaughter houses in India, a large proportion of hides and skins comes from dead animals. The quality of hides from dead animals is inferior to that of those from slaughter houses. "There is also lack of facilities for proper flaying and scientific curing with the result that the hides and skins produced in India are inferior in quality and fetch lower prices in the international market."

Leather and leather goods industries in India are as follows: (*a*) tanning of hides and skins, (*b*) manufacture of leather footwear and (*c*) manufacture of leather goods other than footwear. Tanned hides and skins are mostly exported and occupy fourth place in order of importance in the exports of our country.

There are four sectors in Indian tanning:

1. organised tanneries producing finished and chrome tanned leather,
2. small-scale tanneries producing chrome tanned upper leather,
3. tanneries producing vegetable tanned hides and skins, and
4. village tanneries producing vegetable tanned leather for local consumption.

There are about 35 organised tanneries in India which use highly modern tanning materials for treating 2·5 million pieces of hides and skins. The important centres of modern tanning are Calcutta, Kanpur, Agra, Delhi and Madras. About 2 million chrome tanned hides a year come from 250 small-scale chrome tanneries in Calcutta and a few other places. More than 8 million vegetable tanned hides and 20 million vegetable tanned skins are produced by 500 tanneries which use vegetable tanning materials. Most of such tanneries are in the South. Village tanneries use varam or turwar bark (*Causia Auriculata*). Their methods are crude, and they produce 8 to 9 million vegetable tanned hides and 3 to 4 million vegetable tanned skins.

PRODUCTION OF HIDES, SKINS AND LEATHER

	1951	1956	1960
Tanned Hides and Skins (million pieces)	41	46	47·6
Leather Footwear (million pairs) ...	85	88·5	100

The principal use of leather is for the production of footwear. During the Second World War the industry received a considerable fillip from large military demands for boots and shoes, harness, saddles and other army equipment. In 1960 the production was about 100 million pairs of footwear, of which about 5 million pairs were exported.

India supplies about 30 per cent of the goatskins of the world. The Indian goatskins are considered to be the best raw materials for high class kid. The export of lamb and kid for skins is an interesting development of recent years. In future,

India's fur-skins will play a very useful part in international commerce.

India exports hides and skins undressed, and footwear. Because of the increasing demand for leather in India, the exports of hides and skins are not likely to remain important in the near future. In 1960-61, India earned Rs. 3 crores from the export of 5 million pairs of footwear, and Rs. 9 crores from the export of 119 million kg of hides and skins. The principal buyers of Indian leather and leather goods are U.K., U.S.A., U.S.S.R. and West Germany.

Modern tanning uses *babul* bark and myrobalans in dealing with hides. At present large quantities of wattle bark from East Africa are used in India for tanning purposes as the supply of *babul* bark is not adequate.

The Ship-Building Industry

In the past India had a very flourishing ship-building industry. Even in the 18th century, Indian shipping was very progressive. The Indian shipping industry received a death blow when India lost her political and economic independence in 1857 and steel was introduced in U.K. for ship-building in place of wood. "The use of steam power for the propulsion of ships and of steel in place of timber created a revolution in the technique of ship construction, and released new force which the Indian ship-building industry was unable to withstand."

Today wooden ships are also constructed in India which are known as "country crafts". These crafts are not popular in the eastern coast of India. In the west coast however these crafts are still used. Porbandar and Bulsar in Gujarat are two important centres which make country crafts.

The necessary requisites for the ship-building industry are:

(*i*) Ship-building and repairing yards.
(*ii*) Deep water in the harbour.
(*iii*) Proximity of raw materials.
(*iv*) Supply of labour.

The success of the industry depends also on the availability of raw materials, machinery and equipment for the construction of ships. Steel is required to be supplied in a wide range

of sizes, keeping in view the required strength, maximum dead weight, speed etc. of the vessel and also economy in the cost of production. Though India is fairly rich in iron ore and there are important steel manufacturing centres in India which can supply ship-building materials, yet in the initial stage, engines, propellers and other machinery will have to be imported from abroad.

It is interesting to examine the causes that have led to the development of Visakhapatnam as a ship-building centre. The situation of the harbour at the centre of the eastern coast between Calcutta and Madras offers great facilities for bringing down the necessary materials from the hinterland of these two big ports. Visakhapatnam has the additional advantage of possessing a deep-water harbour which permits the launching of big ships. The tidal range is also satisfactory. Steel, the most important raw material, can be brought to the shipping yard from Jamshedpur, 550 miles away, by the South Eastern Railway. The Gondwana coalfields are also within easy reach. Timber, necessary for making decks, cabins etc., are obtained from Chotanagpur. If railway lines are constructed to connect Waltair with the actual ship-yard, the cost of transport in bringing raw materials will be further reduced. The local man-power is cheap and seems to be suitable for modern technique, if properly trained. Thus the Visakhapatnam ship-yard has become a very good ship-building base and builds ships at internationally competitive prices. *The Scindia Steam Navigation Company* in 1941 opened a ship-building yard at Visakhapatnam for the building of medium-sized ocean-going vessels. In 1948 one 8,000-tonner was turned out from this yard for the first time. In 1952, the Hindusthan Shipyard Ltd., took over the Visakhapatnam yard from the Scindia Company. In the Hindusthan Shipyard Ltd., the India Government has two-thirds of capital invested, the balance of one-third being owned by the Scincia. Between 1948 and 1958, the Hindusthan Shipyard built 24 ships. The present capacity of ship-building at Visakhapatnam is 20,000 GRT. The shipyard has four building berths to build ships ranging from 5,000 to 15,000 tons deadweight capacity. The programmes for the Third Plan include expansion of the Hindusthan shipyard and the construction of a dry dock at Visakhapatnam so as to enable the Visakhapatnam

shipyard to produce ships of a total tonnage of 50,000-60,000 D.W.T. per year.

Bombay and Madras cannot conveniently develop the ship-building industry. Bombay is many hundred miles away from the coal and iron fields. The harbour of Madras is artificial and the sea is shallow. Therefore, big sea-going steamers can not be launched. The backwater at Cochin provides an excellent harbour and a yard for special repair-work. There is a scheme to develop a second ship yard at Cochin in the Third Plan period. The most ideal sites rear Calcutta are Uluberia and Rajganj because better depths of water are available here. As ship-building centre, Calcutta has the advantage of being near the source of raw material supply and in the midst of a highly developed mechanical engineering industry.

The ship-building industry is essentially an "assembly in-industry". Propelling engine and its auxiliaries, electrical fittings, wireless, cargo building gear, steel, etc., are required in each ship. The great problem of the ship-building industry is the shortage of ship-building plates in the country. The ship-building steel is available in India from only one rolling mill. Consequently foreign steel is imported, and the cost of ship-building is high. Efforts are being made to meet the requirements for new construction of deep-sea-going vessels.

Aircraft Manufacture

The possibilities of an aircraft industry in India are very promising. Apart from the requirements of military aircraft, India with its long distances and excellent visibility, has vast possibilities of civil aviation.

The Indian Union has now more than 40 air service routes covering about 14,000 route-miles. There are now 16 daily services and 42 weekly services.

In 1939, the Government of India turned down the scheme of the Scindia Steam Navigation Company for the manufacture of aircraft in India as "impossible". As a result of the changing course of the war, however, the Government declared in 1940 that "it was Government's intention to proceed with the scheme as soon as the necessary plants and materials became available." An aircraft factory was floated in Bangalore in 1941.

This factory has now been taken over by the Government and is engaged in the repairing and production of aeroplanes*. The advantages of Bangalore are the availability of cheap electric power, equable climate, central situation and remoteness from the sea-coast, existence of the Science Institute and the proximity of an iron factory. It has already become the largest aircraft manufacturing and overhauling organisation in the East. There are two divisions in the Hindusthan Aircraft Industry—one for manufacturing jet fighters and the other for jet engines. At Barrackpore in West Bengal, a small unit of the Hindusthan Aircraft has been opened to attend to overhauling. Jamshedpur is also a potential site for the manufacture of aircraft.

Automobile and Ancillary Industries

The importance of establishing automobile industry in India was first realised in 1945 when the Government of India constituted a Panel on Automobiles and Tractors for making recommendations for the manufacture of automobiles in India. In 1948, the Government declared the automobile industry as of national importance. *There are fair prospects for the development of an automobile industry in India.* The establishment of automobile industry will naturally help the development of motor transport as a means of rapid communication for the movement of motor transport. In a vast country like India, motor transport as a means of rapid communication for the movement of agricultural produce and the distribution of manufactured goods can render great services. Therefore a well-established automobile industry can be an integral part of a sound, progressive economy of the country.

Recently eight companies have floated assembly plants in Calcutta, Bombay and Madras. *The Calcutta Centre* was started in 1944 by the Hindusthan Motors Ltd. The Company has plants to manufacture complete trucks and motor cars and is linked up with Morris Motors, England and 'Studebaker' cars in India. A well-equipped factory has been built up at Uttarpara, near Calcutta, for assembly work. This factory has been manufacturing all the vital components of the cars includ-

* The name of the company is the Hindusthan Aircraft Factory.

ing castings and forgings. *The Bombay Centre* was also started in 1944 by Premier Automobiles Ltd. This company is linked with Chrysler Group of U.S.A. and manufactures cars and trucks. Bombay centre is now manufacturing the engine, the transmission assembly and shock absorbers. It is also making radiators, springs and universal joints. *The Madras centre* is making engines, and commercial vehicles of 5 tons and above. The other possible sites of the industry are Burnpur and Jamshedpur which, besides being near or in the heart of iron areas, can conveniently use imported machines and parts. As these centres are already noted for engineering industries, the supply of trained labour and various parts for the automobile industry are available.

PRODUCTION IN AUTOMOBILE AND ANCILLARY INDUSTRIES

(in 000)

	1950-51	1955-56	1960-61
i. Passenger cars ...	8·2	11·9	20
ii. Commercial vehicles	8·5	19·0	28
iii. Jeeps and Station wagons .	·3	5·0	5·5
iv. Automobile ancillaries . .	—	--	0·7
v. Motor cycles and Scooters ..	—	1·5	18

Two successive stages are noticeable in the development of Indian automobile industry. In the first stage, all component parts were imported for assembly. The second stage saw the manufacture of component parts in India. At present more than 75 per cent of the parts are manufactured in India. Essentially the automobile industry is a component construction and assembly business. So, India need not produce all the parts and accessories used in building up automobiles. Mining and metal industries, chemicals, glass, leather, rubber and textile

industries supply raw materials for the production of a finished motor car. In India, however, some of these basic and ancillary industries have not been properly developed. Of the raw materials, iron and steel are by far the most important. Although it may not be possible for India to be self-sufficient in regard to all basic raw materials, India can at least be self-sufficient in steel and iron for automobile industry. India while manufacturing most of the parts necessary must import some parts for some time for the industry. The automobile industry of India is likely to manufacture 95 per cent of the component parts of cars in India itself by 1966. The existing units in the automobile industry have long-term production plans which when fulfilled will meet the entire demand for cars and trucks. The automobile industry is a protected one. The rated established manufacturing capacity of the industry in 1965-66 will be 100,000 automobiles per year (30,000 cars, 60,000 trucks 10,000 jeeps). About 48,000 to 60,000 motor cycles and scooters will be manufactured annually after 1965-66.

It is hoped that India will be in a position to export automobiles and accessories in the near future. In fact, a start has been made in this direction though in a very small way by exporting vehicular trailers of the value of Rs. 8 lakhs in 1960-61.

Lac Industry

The name 'lac' is derived from the Sanskrit word "*Laksha*" meaning a hundred thousand referring, no doubt, to the innumerable insects that take part in securing resin.

Lac is virtually a monopoly of India and is grown chiefly in Bihar, West Bengal, Orissa and Madhya Pradesh. The areas produce about 85 per cent of the total production. Chotanagpur in Bihar alone is responsible for 50 per cent of the total. In West Bengal lac is produced in Malda, Bankura and Purulia. The annual production of lac in the country is about 1 million maunds. *In its refined form, in which it is usually packed for export, it is known as shellac.*

The insect which produces lac is known as *Laccifer lacca.* It lives as a parâsite feeding on the sap-juices of certain trees like Palas, Kusum, Ber, Kahir, Ghont and Arhar.

Lac yields two products—dye and resin. Lac dye trades are no longer important because of the discovery of the aniline dyes. It is now the resin for which lac is important.

Lac is used in a variety of industries. Between thirty and forty per cent of the total lac is consumed by the gramophone records industry; another thirty-five per cent is utilised by the electrical, paint and varnish industries. Lac is also used in sealing-wax manufacture, photographic materials, the confectionery trade, bangles, toys, shoes, dressings, micanite, grinding stones, munitions and fireworks. A disquieting feature is the decline in the use of resin in gramophone record because of synthetic resin. There are 489 small factories in India for processing sticklac into seedlac and other kinds, of which 405 factories are located in Bihar. Except for two factories in Calcutta, the processing is done by indigenous methods in all other factories. The two factories of Calcutta are highly mechanised. Calcutta is also the principal distributing centre for lac and lac products.

About 90 per cent of the production of shellac is exported to the United States of America, U.K., West Germany, and Japan. America alone takes about 45 per cent of the total production. The Government of India in the interest of export trade insists that lacs to be exported must conform to such quality standards as are generally accepted in the export trade in lac. In 1960-61, India earned a little more than Rs. 6 crores from exports of lac.

Although lac is a virtual monopoly of India, its position is by no means secure because of the introduction of synthetic products in foreign countries. Bakelite is now largely used in the electrical trade. In the varnish trade, cellulose preparations are common.

Before the Second World War, India produced 90 per cent of the world's supply of lac The remaining 10 per cent was produced in Thailand, Indo-China and Burma. The refining of raw lac into shellac and seedlac was also the sole monopoly of India as the other producing countries sent their raw lac to India for processing.

Thailand is now producing more lac and is also refining it into shellac for direct export to the U.S.A. and other foreign countries. There is evidence, too, of improvement in the

quality of the Thailand shellac and with all that its price is about two-thirds that of Indian shellac. Shellac factories have been started in Thailand for an annual output which is about one-third of India's production. Effective measures for improving the quality of lac and extending shellac markets both in India and abroad have been taken in India. A Shellac Export Promotion Council has been set up, whose efforts have succeeded in improving the quality of products as well as exports.

The Indian Lac Research Institute at Namkum near Ranchi is concerned with devising improved methods of cultivation, improving the quality of lac, finding new uses for shellac and organising research in consuming countries in co-operation with the industries using lac.

The Cement Industry

Cement is a specially prepared material which is used as a binder for stones and brick masonry or as a matrix in the production of concrete. At present in India, cement ranks only next to steel in regard to materials for construction. To a certain extent, the production and consumption of cement can be taken as the measure of our country's industrial progress. The industry also produces articles manufactured from cement, such as ordinary concrete, reinforced concrete, marble imitations and cement sheets. The demand for cement is on the increase because of the construction of river valley projects, new ports, townships, airfields, roads, factories, hospitals, schools etc. which the country has undertaken as nation-building tasks. The cement industry in India enjoys many natural advantages, such as abundant supply of limestone of excellent quality occurring in many parts of the country close to railway lines, suitable clay also close to railway lines, and the production of gypsum in the country. With regard to fuel, however, the industry labours under a considerable handicap as all the concerns are situated at long distances from the coalfields, and the shortage of coal on account of transport bottleneck is a very serious problem. The chief raw material for cement is limestone. About 1·6 tons of limestone are required to make 1 ton of cement which contains 4 per cent gypsum and 38 per cent coal.

Location of Cement Factories*

Areas	Centres
Bihar ...	Dalmianagar and Japla, Chaibasa, Sindri, Khalari (Ranchi), Kalyanpur and Sone Valley.
Madhya Pradesh ...	Jabalpur, Gwalior and Katni.
Madras	Madhukarai (Coimbatore), Dalmiapuram (Trichinopoly), Mangalagiri (Krishna), Tirunelveli.
Punjab	Bhupendra, Dalmia, Dadri.
Orissa	Rajgangpur.
Mysore	Bangalore.
Gujarat ...	Okhamondal (Porbandar), Sevalia.
Kerala	Kottayam.
Rajasthan ...	Sawai Madhopur, Lakheri.
U.P.	Allahabad.
Andhra	Bezwada, Hyderabad.

In 1961 there were 35 cement factories in India.

Though the industry is widely distributed, the production is comparatively high in centres where both limestone and power are available. In U.P., however, the deciding factor has been the availability of markets near at hand. In almost all States, the cement industry has developed. In the case of some States, the location of cement factories has been very favourable from the point of view of raw materials and markets. Non-availability of lime stone of suitable grade near the location has been responsible for low production in certain factories.

The manufacture of cement in India was started as early as 1904 in Madras, although its production was negligible. The first World War gave impetus to the industry, and factories were started at Porbandar (Kathiawar), Katni (Madhya Pradesh) and in Rajasthan. Since then the industry has progressed very

* Nine new factories are being set up, two each in Maharashtra and Madras and one each in Mysore, Andhra Pradesh, Pondicherry, Assam and Kashmir.

rapidly, and the country has almost attained self-sufficiency. The cement industry is in a position now to meet the full requirements of the country.

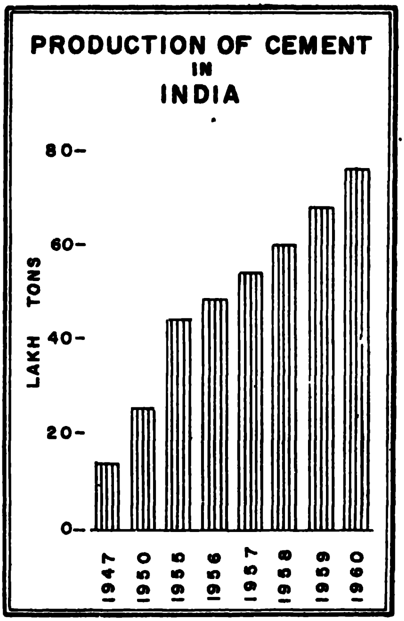


FIG. 61.

Because of the national emergency, the cement industry has acquired added importance as large quantities of cement will be required for defence programmes like embankments, road construction and buildings. The third Five Year Plan target may not be adequate for the purpose.

It would be possible to produce 15 million tons of cement by the end of the Third Plan period. Much however will depend on expanding the output of lime stone to meet the requirements of the cement industry. The *per capita* consumption is still very low. The *per capita* consumption of cement in India is only 27 lbs. compared to 411 lbs. in England, 516 lbs. in U.S.A., 740 lbs. in Sweden, 716 lbs. in Belgium, 460 lbs. in Denmark and 90 lbs. in Japan.

India is also developing a small export trade in cement, and the buyers are Iraq, Ceylon and Indonesia. In 1960-61, about 92,000 tons of cement were exported. The countries around India and the Persian Gulf as well as those to the south-east of India can be supplied with cement by India at competitive rates on account of her favourable position from every point of view. Besides, these countries too have development programmes for which they will require cement. As the sources of raw materials are not located at convenient places, the cost of transport becomes heavy. In future it will be necessary to devise

ways and means to utilize low grade limestone so that more areas can manufacture cement. Pozzolana, a type of cement is being manufactured at Bhakra Dam to replace cement for purpose of concreting. Pozzolana is made of shale which is available in abundance near the Dam site.

There are about eleven companies which control the production of cement in India. The Associated Cement Companies Ltd. is the single largest manufacturing group. The next is the Dalmia group which runs five factories with a rated capacity of 9 million tons. There are nine other individual companies.

PRODUCTION OF CEMENT FROM 1951 TO 1962
AND TARGET FOR 1965-66

Year	Actual Production ('000 tons)
1951	3,195
1954	4,398
1955	4,486
1956	4,928
1957	5,601
1958	6,072
1959	6,828*
1962	6,222
1965-66 [Third Five-Year Plan (Target)]	13,000

Match Industry

The Indian match industry owes its development to the protective tariff it enjoys. Before 1921 there was no successful manufacture of matches in India except a very small one in Ahmedabad.† With the imposition of duties on imported matches since 1922, there has been a considerable expansion of

* From July 1959 onwards figures are in Metric Tons.

† The first match factory which still survives is the Gujarat Islamic Match Factory which was established in Ahmedabad in 1895.

the match industry, which enjoys a large home market and cheap labour. In order to avoid the protective import duty, a Swedish Company established factories in India during 1924 and 1925 at Bareilly, Calcutta, Madras and Ambernath. This company (Western India Match Co. Ltd.) has now a virtual monopoly of match production in this country and meets nearly 80 per cent of the demand.

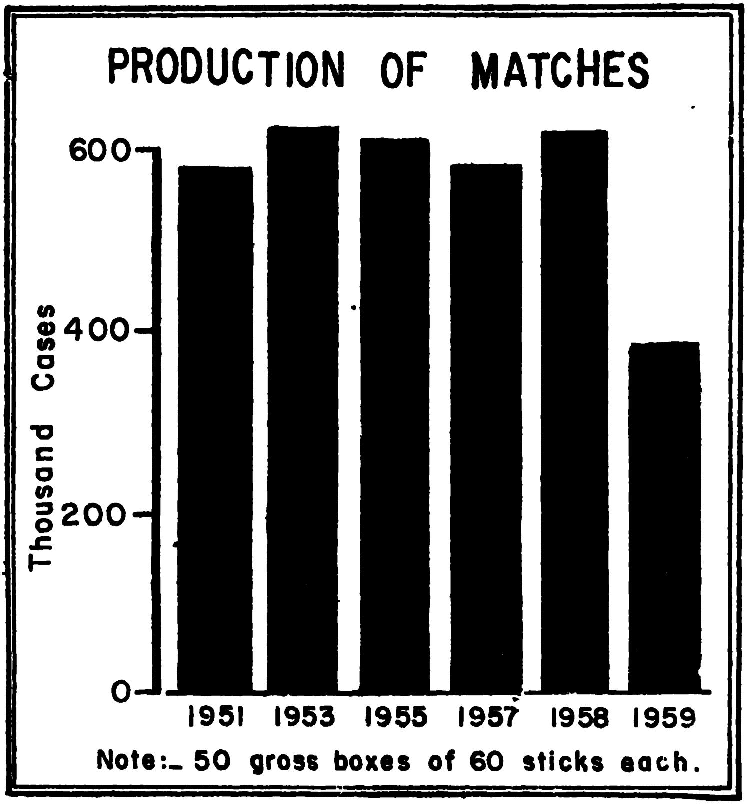


FIG. 62.

At present the Indian Union has 62 match factories. The industry employs about 25,000 workers. The match factories are located in Gwalior, Hyderabad, Dhubri (Assam), Kota (M.P.) and Shimoga (in Mysore), Petland (in Baroda), Madras (Tiruvattiyur, 18 miles from Madras), Calcutta and Trivandrum.

PRODUCTION OF MATCHES
('000 cases)

1950	523
1953	590
1955	615
1958	630
1960	680
1962	576

The expansion of the industry depends upon the adequate supply of suitable types of wood and raw materials like sulphur and phosphorus. The Indian match industry consumes over 6 million cubic feet of wood every year. Andaman Islands are an important source of wood for the Indian match industry. Sulphur and phosphorus are, however, imported.

Small-scale and Village Industry

With more than 20 million persons directly associated, the small-scale and village industries occupy a prominent position in the economy of the country.

From the point of view of size and location, the small-scale and village industries may be classified as follows:

(*a*) Handicrafts
(*b*) Small-Scale Industries
(*c*) Village Industries

India has always been famous throughout the world for her handicrafts. The handicraft industries are commonly located in rural areas, and the products are made for markets with which the individual producers have direct touch. Rags and carpets, ivory products, bidri works, toys, brass work, wood works are certain products which have wider demand in the country. Of late, some of the artistic products of the handicraft industries are being exported outside.

The small-scale industries work for a larger market, inside and outside the country and aim at simplifying and standardising their production. Some of the small-scale industries use machine, power and modern techniques.

All units or establishments having a capital less than Rs. 5,00,000 and employing less than 50 persons when using power come within the scope of small-scale industries. The small-scale industries are located in "urban" areas and their development has become the responsibility of the States. The products are bicycles and parts, sewing machines and parts, agricultural implements, hand tools, locks, sports goods, utensils, diesel engines and parts, storage batteries, leather footwear, electric fans, trunk manufactures, drugs, soap, electroplating, etc. With a view to providing conditions favourable to productive efficiency, maintenance of quality standards in production and economic utilization of materials and equipment by small-scale industries, the Government has opened 60 *industrial estates* in the country. Another 60 industrial estates will be completed soon. Most of the estates are located near small and medium sized towns. A few have been established in rural areas. Each estate provides workshop space, electricity, water and transport facilities to a number of small-scale industrial units. Being located near one another, the units can use the equipment and services of one another. The owners of small units can also buy machinery on hire-purchase system through the *National Small-Industries Corporation* which also arranges for the purchase of products from the small units on Government contract. Small-scale units can be developed as ancillaries to large industries for the supply of components and parts to them. In fact, in several industrial estates the small units are functioning as ancillaries to large industrial undertakings in Mysore and Maharashtra.

A village industry has the characteristics of both handicrafts and small-scale industry. Such an industry is carried on wholly with the help of members of the family, and not hired labour, either as a whole-time or a part-time occupation. The distinct feature is its location in the home of the persons and not outside though it may use certain technical and organisation methods of handicrafts and small-scale industries. As a village industry is usually associated with agriculture, its geographical location is "rural". The typical village industries are hand-pounding of rice, vegetable oil (ghani), ghee, tanning, gur and khandsari.

Handloom industry is of tremendous importance, as it supplies more than one-third of the cloth produced in India. In fact it is as widely spread as agriculture. More than 1,000

million yards of cloth are produced annually by the handloom industry which also consumes about 700 million yards of yarn. By consuming large quantities of yarn, the handloom industry has become an indispensable market for cotton mill industry. The chief feature of the handloom industry is the fact that it specialises in the production of a variety of cloth, the market for each of which is limited. Consequently, the mills find it uneconomical to manufacture such products. Hand-spun yarn from *Charka* is more being used extensively by the handloom industry. It is estimated that about 300 million yards of cloth are produced annually from hand-spun yarn (khadi).

The problem of small-scale and village industries are (*a*) the lack of raw materials of good quality, (*b*) out-moded implements, (*c*) defective marketing, (*d*) lack of finance, (*e*) high cost of production and (*f*) lack of technical knowledge.

Some Notable Village Industries

Assam	...	Handloom (cotton and silk), basketry
U.P.	...	Gur and khandsari ; handloom ; vegetable oil ; carpet ; handicrafts ;
Kerala	...	Coir spinning and weaving
Madras	...	Handloom (silk and cotton)
Rajasthan	...	Utensils, stone work, handloom (cotton) ; handicrafts
Orissa	...	Handloom ; handicrafts
Bihar	...	Handloom (silk and cotton)
Punjab	...	Handloom (wool) ; sports goods ; ghee
West Bengal	...	Handloom (cotton and silk) ; hand pounding of rice ; handicrafts
Madhya Pradesh	...	Handloom (cotton and silk)
Andhra Pradesh	...	Carpet ; handloom ; handicrafts
Maharashtra	...	Tanning ; khandsari ; handloom ; handicrafts
Gujarat	...	Ghee, handloom, handicrafts.

It will thus be observed that handloom and handicrafts are the most common occupations in rural areas of India. Behind their common pattern of production, regional characteristics of taste and tradition are reflected in their products like shawl of Kashmir, carpet of Mirzapore, brass work of U.P., saries of the South and West Bengal, ivory of Mysore, etc.

Coir yarn and manufactures, handloom fabrics and handicrafts are exported to the U.S.A., U.K., West Germany, and other European countries at an annual average value of about Rs. 21 crores. The products of small-industries like cotton hosiery, sports goods, light engineering products, etc. have great scope for export. It is, however, essential that more attention is paid to improvement and standardisation of quality, reduction of cost, introduction of new designs and proper organization of production.

QUESTIONS

1. Mention the sites where new factories are being set up for the manufacture of iron and steel, and account for their locations. (Rajasthan B.Com. 1960).

2. Account for the present geographical distribution of either the Indian cotton industry or the Indian iron and steel industry. (I. I. B. 1948).

3. "The cheapest supply of particular varieties of agricultural raw materials, minerals and forest products in their natural distinctive zones has had a consequential effect on the geographical distribution of India's principal industries." Examine this statement with reference to any two industries.

4. India's sugar-industry is of recent growth. Mention the factors for its development and the provinces where mills are located. (Raj. M.Com. 1956).

5. State briefly the present condition of the Indian paper industry. Name the indigenous raw materials used for manufacturing paper and mention where they are found. (Agra B.Com. 1961 ; Cal. B.Com. 1959).

6. Give an account of the iron and steel industry of India with special reference to (*a*) sources of raw materials and (*b*) geographical reasons for the location of the industry. What are the expansion schemes in this industry under the Second Five Year Plan?
(Cal. B.Com. 1961 ; Delhi B.Com. 1959 ; Agra 1953 ; Rajputana M.Com. 1955 ; Indian Institute of Bankers 1962).

7. Account for the location of the jute industry on the banks of the Hooghly basin. Discuss the position of the industry in regard to raw jute supply. (Agra B.Com. 1952 ; Cal. Inter. 1957 ; Cal. B.Com. 1960).

8. Give a geo-economic description of the cotton textile industry in India with reference to raw materials and location of the industry. Explain why the industry is so widely dispersed though the cotton cultivation is mainly confined to the Deccan. (Rajasthan B.Com. 1957, 1960).

9. Why was Jamsedpur selected by Tata's for the location of their Steel Company? What subsidiary industries have been established there?
(Rajasthan B.Com. 1960).

10. Explain briefly the various factors which are responsible for the location and development of the following industries

(*a*) Cotton industry in Ahmedabad

(*b*) Woollen industry in Kanpur.
(Indian Institute of Bankers, 1960)

11. What special advantages has Bombay for the establishment of cotton mills? Do you think Orissa and Assam are proper places for the development of cotton textile industry? (Delhi U. Prep. 1950).

12. Analyse the geographical factors which favour the development of large scale manufacturing industries in India.

13. Write a short note on the future of small scale industries in India.
(Indian Institute of Bankers 1962).

14 Draw a sketch map of India and show therein the locations of the three iron and steel plants in the public sector. (Cal. B Com. 1960).

15. Give an account of the cement industry in India with reference to (*a*) sources of raw materials, (*b*) locations and (*c*) markets.
(Rajasthan B Com 1961).

16. What are the industrial regions in India? Explain the geographical factors which are responsible for their location.

CHAPTER XIII

FACILITIES OF TRANSPORTATION

The extension of transport facilities is most essential for the rapid development of our economy. A good co-ordinated system of transport by land, water and air is one of the most important requisites for the prosperity of a nation. Transportation permits a country to utilize its economic resources to the best possible advantage. In the past, the dominant considerations in the development of transport and communications in the country were trade and administration. After 1947, the transport sysem has been oriented to develop the economy of our country. Indeed, an efficient and well-developed system of transport is vital for the rapid industrialisation of India. The efficiency of transport depends on its speed, safety, dependability, and cheapness. Since heavy demands have been placed on the transport by India's developing economy, it is essential that the capacity of transport is increased. Normally, in all advanced countries the transport capacity is higher than the growth of industrial capacity. In India, however, the position is reverse and many industries suffer on account of transport bottlenecks.

About 25 per cent of India's industrial capacity remains unutilised because of shortage of raw materials, power, spare parts and transport. "It would not be surprising if transport were responsible for at least a fifth of current under-utilisation." Though there has been an increase of 100 per cent in the ton/miles worked by Indian Railways and 200 per cent on the roads over the decade from 1951 to 1961, the Indian industry has still the major problem of stock-piling finished goods or running short of raw materials. The present national emergency with the consequent allocation of transport facilities to the defence effort has made the transport bottleneck problem very complicated.

Transportation in India can be divided into four heads: (*i*) railways, (*ii*) roads, (*iii*) waterways, and (*iv*) airways.

Railways

Railways play a vital role in the economy of India. It is on the railway system that the efficient functioning and growth of India's economy depend. The Indian railways system is by far the largest in Asia and the second biggest State-owned enterprise in the world. The Indian railways employ more than 1 million persons. Originally railways were built up in India for military purposes. The frequent visitations of famine also necessitated the extension of railways. The railways have brought about an equalisation of prices throughout the country. The rapid industrialisation of the country is largely the result of railway developments; it has fostered agricultural production and encouraged the establishment of industries. The mining industry, in particular the coal industry, owes much to railways. In 1959-60 India had 35,200 miles of railway lines.

The Indian railways carry more than 80 per cent of the goods traffic and 70 per cent of the passenger traffic of the country.

The physical and geographical conditions for operation of the railway network in India are most favourable in the Gangetic basin which is an enormous plain of dense population. The mountains in the north and the Western Ghats present considerable difficulties with regard to the construction of railway lines. The Satpura and Vindhya ranges are low, and the railway lines can by-pass the big ranges or cross them by means of tunnels. The Thar desert in Rajasthan with scanty population and the high mountains in Kashmir make railway operation difficult. Large rivers which have strong currents present difficulties in the construction of bridges. Many rivers also give rise to floods during the monsoon in U.P., Bihar, West Bengal, Orissa and Assam. The railway routes have therefore been constructed along areas which offered least physical resistance. Thus, in India the railway-route pattern has been very much influenced by the forces of economic geography.

Railway lines operate on three gauges: 5′6″, 3′3⅜″ and 2′6″. The frequent changes of gauge and the scarcity of bridges across some of the bigger rivers are still the main drawbacks of the Indian railway system.

FIG. 63.

An indication of the volume of traffic handled by railways may be obtained from the following figures:

	1955-56	1960-61
Passenger Miles (billions) ...	38·8	48·6
Freight Carried (Million tons) ...	114·0	154·0
Passengers Carried (in millions)	1,297	1,579

The railway freight increase is mainly due to the movement of coal to different areas for industries, jute manufactures, raw cotton, cotton textiles and sugar-cane. Whenever there is

diversion of transport in favour of any industry or raw materials, other industries suffer. Since the industries are expanding with greater need for raw materials, the present freight capacity appears to be very inadequate. The Third Plan provides for an increase in goods traffic by 23·5 million tons. India requires more railway mileage in order to provide quicker movement of wagons, and relieve congestion in certain sections. In comparison with the U.S.A., Canada and England, India is lagging behind in railway extension. There is also the problem of rail-road competition in certain regions which has diverted high-rated traffic to road transport. To avoid this uneconomic competition, it is desirable "to build railways only where mineral or forestry resources are so large that their exploitation would yield sufficient traffic over years to justify the investment. Where on the other hand, a region is already equipped with railway lines that can handle long-distance traffic with little investment requirements, it may be preferable to avoid major road investments and refrain for the time being from long-distance road transport."

RAILWAY MILEAGE

	Mileage of total Railways	Mileage of line per 100 sq. miles	Inhabitants per mile of line
India	35,000	2·2	8,800
Canada .	43,851	1·10	922
U.S.A. .	2,50,000	8 12	850
U.K. ...	20,609	21·8	2,000

The application of electricity as a source of power on the railways in India is as yet slow. The first electric traction came in use in 1928 when Bombay suburban areas were operated by it. The Bombay Suburban service installation was followed by the electrification of main lines between Bombay and Poona (119 miles) and Igatpuri (85 miles). As a rule, electric locomotives are more powerful and can cope with gradients as well as heavy loads. Because of the design, such trains can run

through monsoon flood water 8 inch above rail level. In 1932, the electrification of Madras suburban service came into operation. Calcutta-Burdwan line started operation in 1957.

The following table gives an indication of the extent of dependence on railways by certain selected industries:

PRODUCTION AND RAILWAY MOVEMENT

(In 000 tons)

	Commodity	1955-56	1960-61
1.	COAL		
	Production ...	38,226	53,000
	Rail movement ...	35,337	49,487
2.	CEMENT		
	Production ...	4,487	7,750
	Rail movement ...	3,956	6,752
3.	IRON AND STEEL		
	Production and Import	2,661	5,100
	Rail movement ...	3,655	7,308
4.	MANGANESE ORE		
	Production ..	1,584	1,800
	Rail movement ...	1,378	1,630
5.	FOOD GRAINS		
	Production and Import	66,494	76,030
	Rail movement ...	9,044	11,298
6.	RAW JUTE		
	Production ...	712	944
	Rail movement ...	512	802
7.	TEA		
	Production ...	284	324
	Rail movement ...	258	304
8.	PAPER AND PAPER PRODUCTS		
	Production and Imports	324	360
	Rail movement ...	256	310
9.	JUTE MANUFACTURES		
	Production ...	1,027	1,100
	Rail movement ...	290	277
10.	RAW COTTON		
	Production and Import	812	941
	Rail movement ...	739	709

11. COTTON TEXTILES		
Production	715	745
Rail movement	548	470
12. SUGAR		
Production	1,615	2,450
Rail movement	1,336	1,847

The present railway lines of India are grouped into seven zones:

1. The Northern Railway.
2. The North-Eastern Railway.
3. The Eastern Railway.
4. The Western Railway.
5. The Central Railway.
6. The Southern Railway.
7. The South-Eastern Railway.
8. The North-East Frontier Railway.

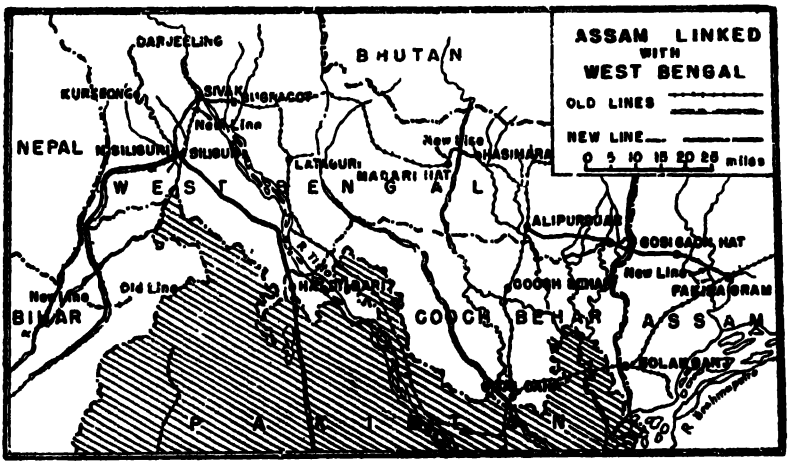


FIG. 64.

The formation of these eight railway zones proceeded on the principle of amalgamating small independent lines and well-defined portions of railways in contiguous areas into self-sufficient systems, in a compact region having economic unity and natural affinities of trade and flow of traffic.

1. The *Northern Railway* with 6,339 miles serves Punjab, Delhi, northern and eastern Rajasthan and Uttar Pradesh up to Mughalsarai. Of the total mileage, *broad gauge* accounts for 3,905 miles, *metre gauge* 2,010 and *narrow gauge* 128 miles. The headquarters is in Delhi. The principal lines which are in broad gauge are:

(*i*) Amritsar—Mughalsarai *via* Jullundur, Ambala, Saharanpur, Moradabad, Bareilly, Lucknow and Varanasi. The route is 725 miles long, and handles a large amount of passenger traffic. There is a connecting line between Saharanpur and Delhi. From Amritsar, a line goes to Pathankot for Kashmir.

(*ii*) Delhi-Ferozepur *via* Bhatinda. Distance 239 miles.

(*iii*) Delhi-Kalka *via* Ambala. From Kalka a narrow gauge line goes to Simla.

(*iv*) Delhi-Mughalsarai *via* Aligarh, Kanpur, Allahabad and Mirzapur. The line is 484 miles long.

The metre gauge system connects Delhi with Bikanir, Jodhpur, Anupgarh and Pokaran.

2. *The North-Eastern Railway* with more than 4,805 miles of metre gauge lines serves the northern part of Uttar Pradesh, and Northern Bihar. This line has been formed with the former Oudh and Tirhut Railway. The headquarters is at Goarkhpur. The line operates in a well-developed agricultural region and carries large quantities of sugarcane, tobacco, tea and rice. The principal railway lines are noted below:

(*i*) Agra-Kanpur-Lucknow to Katihar *via* Gorakhpur, Chapra and Muzaffarpur. The length of the entire route from Agra to Katihar is 787 miles. In 1950 a new line was constructed to connect Katihar with Siliguri. Siliguri was already connected with the main line serving Assam. A new line was laid from here to Fakirgram.

(*ii*) Several branch lines between (*a*) Lucknow and Bareilly, (*b*) Bhatni and Allahabad, (*c*) Chapra and Varanasi.

3. In January 1958, a separate zone was created out of North-Eastern Railway. The new zone is known as North-East

Frontier Railway with headquarters at Pandu. The main lines of the N.E.F. Railway:

(*i*) Maniharighat to Amingaon *via* Katihar, Siliguri, Alipur Duar. The distance is 409 miles.

(*ii*) Pandu-Gauhati-Tinsukia—distance 325 miles.

(*iii*) Several branch lines like Ledo-Dibrugarh, Katihar-Jogbani.

4. *The Eastern Railway* with more than 2,320 miles of line serves Eastern Gangetic region between Mughalsarai and the Hooghly, West Bengal. The Eastern Railway with headquarters in Calcutta handles the largest amount of goods traffic and is one of the most important goods and passenger carriers. Approximately half of the freight movement on this line is coal followed by iron ore, manganese, jute, mica and other products. Throughout the Eastern Gangetic plain, this railway line performs highly varied economic services. The tremendous volume of traffic is accounted for by the fact that the Hooghly basin along with Durgapur and Sindri has a very large industrial base. Besides, Calcutta as a port has both export and import trade.

The principal lines are:

(*i*) Howrah-Mughalsarai *via* Gaya and Dehri-on-Sone.

(*ii*) Howrah-Mughalsarai *via* Patna. Distance 411 miles. Both these lines proceed to Delhi, Saharanpur and beyond by the Northern Railway.

(*iii*) Howrah-Kiul *via* Barharwa, Sahibganj, Bhagalpur and Jamalpur. Distance 254 miles.

5. *The South-Eastern Railway* with 3,399 miles serves the mining areas of South-West Bengal, Orissa and parts of Madhya Pradesh. It has two main lines:

(*i*) Howrah-Nagpur *via* Kharagpur, Tatanagar, Bilaspur, Raipur. Distance 703 miles.

The Nagpur line crosses the rich mineral areas and handles the substantial portion of the traffic composed of manganese, coal, iron ore, etc. Tatanagar—the most important iron and steel centre of India—is on this line. A number of feeder lines

has been constructed to connect Tatanagar with the manganese and iron fields of Bonai, Keonjhar and Singhbhum.

(*ii*) Howrah-Waltair *via* Balasore, Cuttack, Berhampur, Vizianagram. Distance 547 miles. This line proceeds to Madras.

There is a very important line which has connected Raipur on the Howrah-Nagpur line with Waltair. Much of the goods traffic of Madhya Pradesh and Orissa passes through Waltair for export. This Railway which was previously known as the Bengal-Nagpur Railway normally carries 20 million passengers and 18 million tons of goods.

Traffic by diesel motive power is also carried on 295 miles of railway lines in Asansol-Jharsuguda area.

6. *The Western Railway* with more than 5,620 miles of lines serves Maharashtra, Gujarat, Rajasthan, and Madhya Pradesh. The line serves the great industrial areas of Bombay, Ahmedabad and Baroda and handles tremendous quantities of cotton. After the partition, the congestion of traffic on this line has increased considerably because of the loss of Karachi. This line handles about 10 million tons of goods and 8 million passengers. The headquarters is in Bombay.

Principal lines in broad gauge:

(*i*) Bombay-Delhi *via* Surat, Baroda, Ratlam, Nagda, Bayana, Bharatpur and Mathura. Distance 861 miles. Bayana is connected with Agra and Kanpur.

(*ii*) Bombay-Ahmedabad *via* Surat and Baroda. Distance 306 miles. Surat is connected with Bhusaval and the latter with Nagpur.

Principal lines in metre gauge:

(*i*) Ahmedabad-Delhi *via* Abu Road, Beawar, Ajmer, Jaipur and Alwar. Distance 539 miles. Ajmer is connected with Khandwa.

(*ii*) Porbandar-Dhola; Rajkot-Veraval; Kandla-Bhuj; Surendranagar-Okha.

It is proposed to double 163 miles of railway lines between Ratlam and Nagda, Baroda and Anand, and Godhra and Ratlam. The traffic will be carried by diesel motive power on 115 miles of lines between Ahmedabad and Abu Road.

7. *The Central Railway* with more than 5,633 miles of line serves Madhya Pradesh, parts of Andhra and Madras. Bombay is the headquarters of the Central Railway.

The principal lines are as follows:

(*i*) Bombay-Delhi *via* Bhusaval, Khandwa, Itarsi, Bhopal, Jhansi, Agra, Mathura. Mileage 958. Itarsi is connected with Nagpur and Allahabad.

(*ii*) Bombay-Raichur *via* Poona and Wadia. Mileage 443. The line proceeds to Bangalore.

(*iii*) Delhi-Bezwada *via* Itarsi, Nagpur, Wardah and Kazipet. The line proceeds to Madras. Kazipet is connected with Hyderabad.

This line handles cotton and manganese of Madhya Pradesh and timber of Bhopal. Normally it carries 50 million passengers and 11 million tons of goods annually. The headquarters is in Bombay..

About 214 miles of railway lines are being doubled between Delhi and Agra, Katni and Jabalpur and Jabalpur and Itarsi. There will also be electrification between Igatpuri and Bhusaval.

8. *The Southern Railway* has been formed by the amalgamation of Mysore Railway, the Madras and South Mahratta Railway and the South Indian Railway. Its total length is about 6,062 miles. This railway system has both metre-gauge and broad-gauge lines. It serves the densely populated and fertile areas of Madras, Mysore, Kerala and parts of Southern Bombay. The headquarters is in Madras.

Principal lines in broad gauge:

(*i*) Madras-Waltair *via* Nellore, Bezwada. Distance 268 miles. The line connects Madras with Calcutta.

(*ii*) Madras-Raichur *via* Cuddappa. Distance 351 miles. This line connects Madras with Bombay.

(*iii*) Madras-Bangalore. Distance 222 miles.

(*iv*) Jalarpet-Mangalore *via* Salem, Erode, Coimbatore, Tellicherry. Distance 423 miles. Jalarpet is connected with Bangalore and Ootacamund.

Principal lines in metre gauge:

(*i*) Poona-Harihar. Distance 415 miles. This is an alternative route to Bombay from Madras. The line goes to Bangalore from Harihar.

(*ii*) Guntakal-Masulipatam *via* Bezwada. Distance 320 miles.

(*iii*) Madras-Dhanuskodi *via* Tanjore and Tiruchirapalli. Distance 422 miles.

(*iv*) Madras-Trivandrum *via* Tiruchirapalli, Virudhanagar, Madurai and Quilon. Distance 512 miles. From Virudhanagar a line goes to Tuticorin.

The lines lead to several ports like Madras, Cochin, Tuticorin, Alleppey, Quilon and Kozhikode. Grain, cotton, oilseeds, salt, sugar, tobacco, timber and hides are the chief commodities handled. 402 miles of railway lines are being doubled between Arkonam and Jalarpet, Bezwada and Gudur, Jalarpet and Erode and Arkonam and Renigunda. 265 miles of the metre gauge will also be converted into broad gauge. The Madras-Villupuram line of 100 miles will soon have electrification.

Road Transport

Though the history of the road development in India is as old as 4th century B.C. when Emperor Asoka built up a network of roads in his empire, its progress had always been slow over the centuries, depending largely on sudden enthusiasms of some rulers who realised that roads were essential for promoting agriculture, stimulating trade, facilitating pilgrimage, warding off famine and retaining control over the country. The backwardness of India's road system can be judged from the fact that 3 miles of roads serve 100,000 population compared to 2,500 miles in the U.S.A., 934 miles in France and 400 miles in U.K.

Whatever unit of measurement is used, road transport is now the major means of inland carriage of goods in all indus-

trialised countries. In Italy, the roads share 69 per cent of the total volume of surface transport. In Australia, roads carry 52 per cent of the total traffic while in U.K. it is 56 per cent. In India, however, the role of road transport is insignificant both in inter-state and long-distance traffic. The volume of goods handled by motor vehicle is no more than 20 per cent of the railway traffic. There are two principal reasons for the present shortfall of road transport in India: (*a*) deficiency of roads, qualitatively and quantitatively, and (*b*) non-availability of an adequate number of vehicles. India has only 26 miles of road per one hundred square miles of territory compared to 200 miles in Great Britain. At the end of 1961, India had 394,000 miles of roads of which about 144,000 miles are surfaced. Of the surfaced roads, 46,000 miles have asphalt or concrete surfacing and the rest have broken stone surface. About 63 per cent of our roads are village tracks which cannot be used during the monsoon, as with the arrival of the monsoon, these tracks are turned into mud and pools of dirty water.

About 15,000 miles of national highways in India are capable of serving inter-state long-distance traffic. Want of adequate roads is keenly felt in rural areas. Good road communication in a vast country like India, which is predominantly agricultural, is essential. There has been, of late, a tendency on the part of the people, to gravitate towards towns and cities with the result that both urban and rural areas are being adversely affected. The percentage of population in towns and villages of different categories according to the last four census reveals that: (1) the percentage of population living in villages of less than 2,000 people has been progressively decreasing, the rate of decrease being very much marked in the case of villages with a population of under 500; and that (2) the percentage of population living in towns of more than 5,000 people has been gradually increasing, the rate of increase being more pronounced in the case of towns with a population of more than 20,000. This trend is due to the lack of normal amenities in the villages. The deficiency in villages can, to a great extent, be overcome with good road communications. If the economy of the country is to be stabilised, the future road pattern of the country must give due consideration not only to connecting up big towns and

cities but also to providing proper means of access to the rural areas.

"Thus although many fertile tracts of land are well served by rivers, and are potentially rich in agricultural wealth, they remain undeveloped for want of roads." The future road system in the country should be well balanced with regard to the needs of rural as well as urban areas and should take into consideration not only the future trends in traffic but also (1) the needs of semi-developed and undeveloped areas, including forest areas, in addition to the needs of highly developed and agricultural areas; (2) location of administrative headquarters, places of pilgrimage, health resorts, tourist centres, universities, and cultural centres; (3) location of industries, important commercial centres, big railway junctions, and ports; and (4) the strategic needs of the country. Railways alone cannot help the country to continue the development of its potential wealth; roads must be opened and improved—not to supplant the railways in moving goods and people over long distances, but to provide a properly co-ordinated supplement to railway transportation. Because of industrial and agricultural development programmes, the amount of internal traffic is to increase considerably in the near future, the burden of which the railways alone will not be able to cope with. Roads will have to carry most of the traffic in the subsidiary routes.

Big cities in India are now the nerve centres of economic activity. Because of the enormous and fast increasing volume of traffic the roads connecting the metropolitan areas have become highly congested resulting in delay in the movement of goods. It is high time that in India location and construction of express ways are planned in advance to meet the increased economic activity of metropolitan areas, and at the same time help to serve the rural areas.

"India not only requires more roads, but the existing ones should also be improved. She needs more bridges too, for a good road loses its value if some unfordable river or stream lies across it." In the Third Five Year Plan, there will be more construction of bridges, and missing links, and the improvement of existing roads.

It may be mentioned that the present volume of road traffic is no indication of the total capacity of road transport. Because

of numerous Government restrictions, the roads are not fully utilised. "Chief of these is the 300 mile limit imposed on road hauliers; licences to carry goods traffic by road are officially not issued beyond this limit." There is urgent need for some relaxation in the restrictions to transfer certain volume of traffic from railways to roads.

The inadequacy of vehicles is another handicap of road transport in India. The density of vehicles per mile of road in India is about 1½ compared to 21 in U.S.A., 25 in U.K., 13 in Malaya, 8 in Ceylon and 6 in Philippines. In 1959, there were 499,000 motor vehicles on the road. In a country like India whose economy is expanding, the density of motor vehicles per mile of road should be constantly increased to cope with the demand. The position should improve after 1965-66 when India will manufacture 60,000 commercial vehicles a year. Another handicap of road transport is the crushing taxation levied on motor vehicles of all types. In no country in the world is road transport taxed so heavily as in India. In fact, the taxation on carriage of goods by petrol vehicle exceeds the actual freight rate charged by railways. If the number of vehicles is to be increased, there is urgent need for the reduction of rates of taxation.

The roads of India may be classified into four categories: (*a*) National Highways, (*b*) State Highways, (*c*) District roads and (*d*) Village roads. The National Highways or the trunk roads are the main cross-country roads.

The State Highways are the main arteries of commerce within the States. In respect of such road mileage Madras heads the list with 27,115 miles of road compared to 13,400 miles in Maharashtra, 7,776 miles in U.P., 7,535 miles in Madhya Pradesh and 7,000 miles in Punjab. The *district and village roads* carry the traffic into the interior and serve the needs of the rural areas by linking them with the railways and highways.

The building of trunk roads in India received considerable attention during the time of Asoka, and later during the Pathan and Mughal periods. Shershah built between 1540 and 1545 roads to connect Kabul with Sonargaon in East Bengal through Agra, Delhi and Lahore. There were also trunk roads from Agra to Jodhpur, and from Multan to Lahore during the Pathan rule. Trunk road systems were considered strategically

important by the British Government. With the independence of India, the need for a major trunk road system in the country for integration in the national interest has become very conscious. The development of national highways has become the responsibility of the Central Government. There are at present a number of national highways with a total mileage of about 15,000, of which the following are important:

(1) Calcutta to Pathankot via Varanasi, Kanpur, Delhi and Ambala.
(2) Calcutta to Madras.
(3) Madras to Bombay via Bangalore.
(4) Bombay to Delhi via Agra.
(5) Calcutta to Bombay via Nagpur.

In addition, there are national highways from Banaras-Nagpur-Hyderabad-Cape Comorin road, Ahmedabad-Kandla, Hindusthan Tibet road from Ambala to Tibet border, the Assam Trunk road on the south bank of the Brahmaputra and the Assam Access road. Many of these national highways have been made long by connecting the missing links and constructing bridges over big rivers. A long-term plan has been worked out to have an increase of National Highways to 32,000 miles by 1980 in order to provide "a grid system over the entire country so that no places will be more than 40 to 60 miles from a National Highway." Already, India has the largest National Highway network in the whole of Asia.

Some important projects which are under construction on the national highways are the Calcutta-Siliguri road, the Penner bridge on the Madras-Calcutta road, and the Brahmani, Baitarani and Subarnarekha bridges in Orissa on the Bombay-Calcutta road.

The roads are great feeders of railways. They link up the cultivators' holdings with the local markets and the nearest railway stations. Without good and sufficient roads railways cannot collect for transport enough produce to render their operation possible. Roads and railways should be extended in such a manner that roads may become the feeders of railways and not their competitors. The railways should concentrate on long-distance bulk transport, and leave short hauls for roads. Since the efficiency of roads is reduced in crowded areas, the

development should take place in new areas. The Third Plan is rural-oriented, and roads should therefore be developed in these areas.

One serious defect is the slow speed of road construction in India. There is urgent need for developing mechanised construction of concrete roads in India. Most of the operations in road construction today are carried out by manual labour. Mechanisation will not only increase the speed of construction but will also give economy in materials and overhead costs.

The Frontier Routes

Although India has an extensive land frontier of more than 3,000 miles long, the length of good roads is very small. Dense forests, high mountains and deserts have so long hindered the progress of land frontier routes. There is no through railway line from India to her frontier countries. Yaks, mules, camels and ponies are usually employed in maintaining trade relations with Central Asia, Tibet and Nepal.

There is a route which goes from Leh in Kashmir to Tibet and Sinkiang. This is one of the hardest routes in the world, as it includes the Karakoram Pass (18,000 ft.).

Communications with Tibet are maintained through Darjeeling, Nainital and Bettiah.

From Ledo in North-East Assam the route which runs to China through Burma assumed great importance during the Second World War. The route is known as the Stilwell Road (formerly the Ledo-Burma Road). From Ledo, the route proceeds towards the south and reaches Bhamo *via* Myitkyina. A separate road also reaches Bhamo from Lashio. From Bhamo the route goes towards the east and after traversing a series of high mountains reaches Kunming *via* Paoshan. The distance between Ledo and Kunming is 1,044 miles. The same road continues for another thousand miles to reach Chunking.

Waterways

From the earliest times the trade and commerce of Northern India have been much facilitated by the abundance of navigable streams and the flat relief of the region. Before the advent of

the railways, the rivers of Northern India handled a considerable portion of the country's inland trade. But inland navigation received a great set-back with the development of railways. Today, inland water transport in India is of minor importance, its goods traffic in terms of ton-kilometres being only one per cent of that of the railways. The steamer traffic on inland waterways in India at present carries an estimated volume of 2½ million tons only in traffic.

The river traffic of India can be made very important in the transport system as such traffic possesses a tremendous freight capacity. In India, the railways cannot meet all the demands of transport. Several vital commodities require prompt transport. Often industries are held up and production slowed down for lack of an even flow of raw materials. With many industrial development plans now on the anvil, the transport bottleneck is likely to get worse. A planned and co-ordinated development of cheap water transport is one of the principal solutions for this national problem. Both in the interest of long-range development and the over-all economy of the country, water-transport claims a national responsibility. Water transport in India has all the time suffered from the drawback that it has been a provincial subject. The lack of a unified policy and control of integrated care and development and the restrictions on inter-State movements of traffic in the past impeded its growth. The treatment of a river as a unit, irrespective of political boundaries, enables its rational development in the form of extension of navigational channels, co-ordination between railways and water transport, proper apportionment of traffic between road, river and rail, and the enforcement of common commercial policies. The development of inter-State rivers and waterways, therefore, has now become the responsibility of the Central Government.

The great disadvantage of the rivers of India is that they usually enter the sea in shallow, sandy delta-mouths, instead of broad and deep estuaries, which, in other countries, offer a pathway for ships and commerce far into the interior. One of the main causes for the decline of navigation has been the almost complete withdrawal of the dry-weather flow of the rivers for irrigation in their upper reaches with hardly any water left for navigation for hundreds of miles below. Besides,

there are a large number of rivers in the country whose dry-weather discharges are so low that navigation is not possible for the most part of the year.

Because of the presence of large rivers with their tributaries which are all navigable, the north-east region comprising Assam, West Bengal and Bihar has developed a magnificent system of waterways. In the south, the waterways in Kerala connect several minor ports and the major port of Cochin. Inland waterways in the deltaic region of Orissa provide an important means of communication. Madras and Andhra Pradesh have also inland water transport in a limited way.

It is estimated that about 5,000 miles of river routes in India could be made navigable by modern power craft. At present 1,557 miles of rivers are navigable by mechanically propelled country vessels and 3,587 miles of river stretches are navigable by large country boats. Navigation can be developed on shallow stretches either through deepening the channels by regulation works, canalisation and dredgings or by using craft especially designed to negotiate shallow stretches.

India has two great rivers which serve, even today, as arteries of trade and travel. These are the Ganga and the Brahmaputra and they carry the largest part of the river traffic.

The **Ganga** is the most important river of India. The source of the Ganga is an immense mass of snow at 14,000 feet up on the Himalayan range in the Garhwal district. The river is 1,600 miles long. From Hardwar at the foot of the Himalayas, the Ganga flows in a south-easterly direction through the rich alluvial plains of the U.P., Bihar and West Bengal into the Bay of Bengal. For about 500 miles from its mouth, the river maintains a nearly uniform depth of about 30 feet, and therefore, steamers move up to Patna, although country boats proceed as far as Hardwar. "The navigation in the Ganges is quite magnificent and offers probably one of the finest spectacles of its kind to be seen in the world." The Ganga has lost much of its importance as a highway of commerce because of the development of the railways. On the Ganga, steamers used to ply as far up as Gurmukteswar about 400 miles above Allahabad even as late as 1854. The river is now navigable up to Buxar (near Patna). There is a plan to make it navigable once more up to Allahabad.

The tributaries of the Ganga are mostly on its left bank, and these are the *Gumti, Gogra* and *Gandak*. Scanty rainfall and the absence of any snow-capped mountain in central India account for a small number of tributaries on the right bank of the Ganga. The *Jumna* is a great tributary of the Ganga and runs parallel to it for 860 miles and joins the Ganga at Allahabad.

The important towns on the Ganga are Hardwar, Kanpur, Allahabad, Mirzapore, Banaras, Ghazipur, Patna, Monghyr, Murshidabad and Calcutta, while on the Jumna the chief towns are Delhi, Mathura and Agra.

The Ganga Barrage Project. About 400 years ago, the Bhagirathi, which is now only a channel, was the main stream of the Ganga in its last stage. Subsequently, however, because of violent floods or some subterranean upheaval, the Ganga took an easterly turn and joined the Brahmaputra at Goalundo in Faridpur district of East Pakistan.

Since then the Bhagirathi has much deteriorated as a waterway. Meanwhile the Damodar river which is an important tributary of the Bhagirathi, has moved its mouth 70 miles further down. These changes have resulted in the silting up of the Bhagirathi. Thus, today it is only a seasonal river. Even its lower course which is known as the Hooghly is subject to the actions of the tides which are responsible for silting up quite a large part of the river.

Owing to the diminished quantity of water which comes from the Ganga and also because of the tides, the water of the Hooghly river gets a saline character. This is a serious problem affecting the supply of drinking water to Calcutta. Then again with the deterioration of the Bhagirathi there is no proper water transport to connect Calcutta with Northern India. It is possible to have a through water communication between Calcutta and the Gangetic plain through the Bhagirathi.

The present state of the Bhagirathi is also responsible for affecting the condition of Calcutta as a port because it is now becoming dangerous for steamers to move up the Hooghly.

It has been proposed to construct a barrage on the Ganga near Rajmahal which is about 24 miles below Sahibganj in

Bihar. The construction of the barrage will divert a portion of the Ganga water to the Bhagirathi by means of a canal.

The Ganga Barrage Project has the following objectives:

1. Construction of the Barrage across the Ganga in the border of Bengal-Bihar.

2. The provision for a greater volume of water in the Bhagirathi and other rivers of West Bengal.

3. The navigable route between Calcutta and the Ganga.

4. The conservation of the river Hooghly for the benefit of Calcutta by bringing down sufficient head water.

Thus, with the completion of the project the river Bhagirathi will become navigable throughout the year. The salinity of the river Hooghly will also be reduced by the continuous flow of water of the Bhagirathi.

The **Brahmaputra** is one of the longest rivers in the world. It is about 1,800 miles long. It has its source at a height of nearly 16,000 feet, a little east of Lake Manasarowar in Tibet. Flowing eastwards along the foot of the northern slopes of the Himalayas, it enters Assam and takes a sharp bend towards the south-west. After traversing the entire length of the Assam valley, the Brahmaputra again bends towards the south and joins the Ganga at the south-eastern corner of the Pabna district in East Pakistan.

The Brahmaputra is important for carrying Assam oil, tea, timber and jute which are brought to Calcutta by a fleet of vessels whose total carrying capacity is 156 000 tons. "Between both the destinations the volume of cargo carried on this route per year is of the order of 914,000 tons."

The river is navigable by steamers throughout the year and steamers run to Dibrugarh, about 800 miles from the sea. There are certain drawbacks in the river which make navigation dangerous: (*a*) formation of new islands, sandbanks and shoals, and (*b*) the presence of a very strong current during the rains. The rich deposits of silt as the result of floods every year make agriculture very productive in the Brahmaputra basin. In agricultural and commercial utility, the Brahmaputra ranks next to the Ganga.

The principal rivers of Peninsular India are the **Narmada, Tapti, Mahanadi, Krishna** and **Kaveri.** Of these, the Narmada and the Tapti flow towards the west coast. Owing to the greater height of the Western Ghats, the other rivers flow towards the east. These rivers are navigable in their lower courses only during the rainy season.

There are only a few navigable canals in India, the most notable being (*i*) the Circular and Eastern Canals in Bengal, (*ii*) the Ganges Canal running from Hardwar to Kanpur extending over 275 miles, (*iii*) the Buckingham Canal running parallel to the east coast in Madras and Andhra over a distance of 260 miles, (*iv*) the Orissa Coast Canal. and (*v*) the West Canal in Kerala.

In the Godavari and Krishna deltas the navigable canals are the main waterways. The backwaters are also important on the west coast between Cochin and Quilon as waterways.

The need for waterways in India is great. In spite of physical difficulties, much improvement can be made in the existing waterways of the country. Their development would not only remove the congestion of traffic from railways, but would also open up many new areas whose products cannot be moved at present because of high railway freights. If the waterways of India can be systematically organized and exploited, they can become equal partners to the railways in addition to their use for irrigation purposes. There is therefore urgent need to arrest the further deterioration of waterways.

There are good possibilities of developing traffic on waterways in (*i*) the Ganga from Buxar to Allahabad, (*ii*) Gogra up to Bahramghat, (*iii*) Tapti up to Aorakpur, (*iv*) Bhagirathi, (*v*) Mahanadi and Orissa Coast Canal, (*vi*) Buckingham Canal, and (*vii*) Tapti up to Kakvapa and 50 miles above. A Ganga-Brahmaputra Water Transport Board has been set up to carry out development works in regard to inland water transport in the Ganga-Brahmaputra region.

The Sea Routes and Shipping

India has a coastline of over 3,500 miles and merchant ships from all important maritime countries call at her ports. The sea-routes radiate mainly from the six major ports of Calcutta,

Kandla, Vishakhapatnam, Madras, Bombay and Cochin. The principal sea-routes of India are the Suez route, the Cape route, the Australian route and the Singapore route.

The part played by the Suez canal in developing India's foreign trade with the West is significant. The route is responsible for handling more than 75 per cent of India's exports and imports and will remain so as the main route till India develops closer trade relations with the Middle East, East African territories and the South East Asia.

The Cape route connects India with South Africa and parts of West Africa. Sometimes steamers proceed along this route from India to South America. The imports coming into India by this route are cotton, spices, and hides and skins.

The Singapore route is second to the Suez route in respect of volume of traffic. This route connects India with South East Asia. The route also maintains India's trade relation with Canada and New Zealand. The imports coming into India through this route are cotton and silk manufactures, iron and steel, machinery, porcelain, timber, dried fish, graphite etc. The exports from India are chemicals, pig iron, manganese, jute, shellac, mica, plastic goods, toys, engineering goods etc.

The Australian route is gradually becoming important. It connects India with Australia. The imports coming into India are wheat, raw wool, horses, canned fruits, provisions etc. The exports from India are jute, tea and linseed. The chief ports of Australia engaged in maintaining trade relations with India are Brisbane, Sydney and Melbourne.

Indian ships at present carry 8 to 9 per cent of India's overseas trade.

The coastal shipping is as yet a weak limb of the Indian transport system. Though the maritime states in India possess goods sea board and many good harbours, the level of economic development in the different hinterlands does not at present ensure an increasing volume of cargo. The coast-wise transport is reserved for Indian-owned shipping, but, even then, foreign ships are required to participate in the trade during periods of peak cargo offerings. The wet cargo like oil is handled exclusively by foreign tankers. The target for Indian coastal shipping in 1961-62 was 4·12 lakh gross tons against which the actual tonnage handled was 2·68 lakh tons.

TONNAGE POSITION FOR THE COASTAL AND OVERSEAS TRADE

(in lakh G.R.T.)

		1950-51	1955-56	1960-61
Coastal	...	2·17	2·40	2·92
Overseas	...	1·74	2·40	6·13
Total	...	3·91	4·80	9·05

The Government of India has given a high priority for the development of Indian shipping. Indian shipping carries now 50 per cent of the cargoes moving along India-Burma and India-Ceylon lines. Indian shipping companies are now maintaining regular cargo services in the India-U.K.-Continent, India-Malaya, India-U.S.A. and India-Australia trade. With a view to inspiring confidence in the Indian companies which are engaged in overseas trade, the Government formed two shipping corporations in co-operation with the existing Indian Shipping Companies.* The Eastern Shipping Corporation which was set up in 1950 as a Government sponsored corporation, operated services between India and Australia, India and Far East, India and East Africa, Madras and Singapore and Calcutta/Madras and Andamans. The second Corporation—The Western Shipping Corporation—was set up in 1956 to strengthen the Indian fleet operating on the overseas routes to Persian gulf, Red Sea and U.S.S.R. and Poland. In 1961, the Shipping Corporation of India Ltd. was formed by the merger of the two corporations. It has regular passenger cum cargo services to East Africa, Singapore, U.K., U.S.S.R., Poland, Middle East, Australia, Far East and Japan. The Government has set up a National Shipping Board in 1959, to advise on all matters relating to Indian shipping including specifically the problems of development of shipping in future.

The broad objectives of Shipping Plan are (*a*) to cater fully for the needs of coastal trade with due regard to the possibility of diverting some traffic from railways to coastal shipping; (*b*) to secure an increasing share of India's overseas trade for

* The Indian shipping companies are: (*i*) Scindhia Steam Navigation Company which owns about 40 p.c. of the total Indian tonnage for coastal and overseas trades of the country, (*ii*) Bombay Steam Navigation Company for coastal trade, (*iii*) Indian Steamship Company of Calcutta, (*iv*) Great Eastern Company for tramp and coastal trade, (*v*) Bharat Lines for coastal, Burma and Persian Gulf Lines and (*vi*) Malabar Steamship Company for Persian Gulf trades.

Indian ships, and (*c*) to build up the nucleus of a tanker fleet. "The building up of our merchant navy is not just a matter of prestige but one of imperative economic necessity." Shipping is a basic industry and is also a great earner of foreign exchange by contributing to the large invisible exports by way of shipping services. It is recognised that the expansion of shipping will enable India to save foreign exchange expenditure with regard to carriage of the country's overseas trade.

For expanding shipping activities, it is imperative as a first condition to increase the volume of cargo on the coast. There are possibilities of diverting coal and salt from railways to shipping which will keep the flow of coastal trade uniform and remove the congestion from the railways.

Development of Air Transport

The Indian Union has become a vital force in this modern air age, having acquired the fourth place in civil aviation among the nations of the world. As a meeting point of the air routes between the East and the West, India holds a key position in international aviation. With its vast distances and favourable climate throughout the year, India provides an ideal field for air transport.

Though the Government of India decided to open air routes in India as early as 1920, the actual work was started in 1924. But progress was slow until the Second World War. The speedy advancement of civil aviation after 1947 in India is regarded as having no parallel in the world. Air transport in India has come to occupy a place of increasing importance in the transportation system of the country.

The Indian Union has three big airports at Bombay (Santa-Cruz), Calcutta (Dum Dum) and Delhi (Palam), maintained at international standards, 8 major aerodromes at Ahmedabad, Madras, Nagpur, Hyderabad, Bangalore, Gauhati, Tiruchirapalli and Delhi (Safdarjung), 38 intermediate aerodromes and 36 minor aerodromes. In all, there are 85 aerodromes controlled by the Civil Aviation Department of the Government of India. The Government of India propose to construct in the immediate future new civil aerodromes in 14 places, namely, Ajmer, Aligarh, Berhampur, Calicut, Cuddalore, Dehra Dun,

Hubli, Mangalore, Nellore, Ootacamund, Salem, Ratnagiri, Saugor and Surat

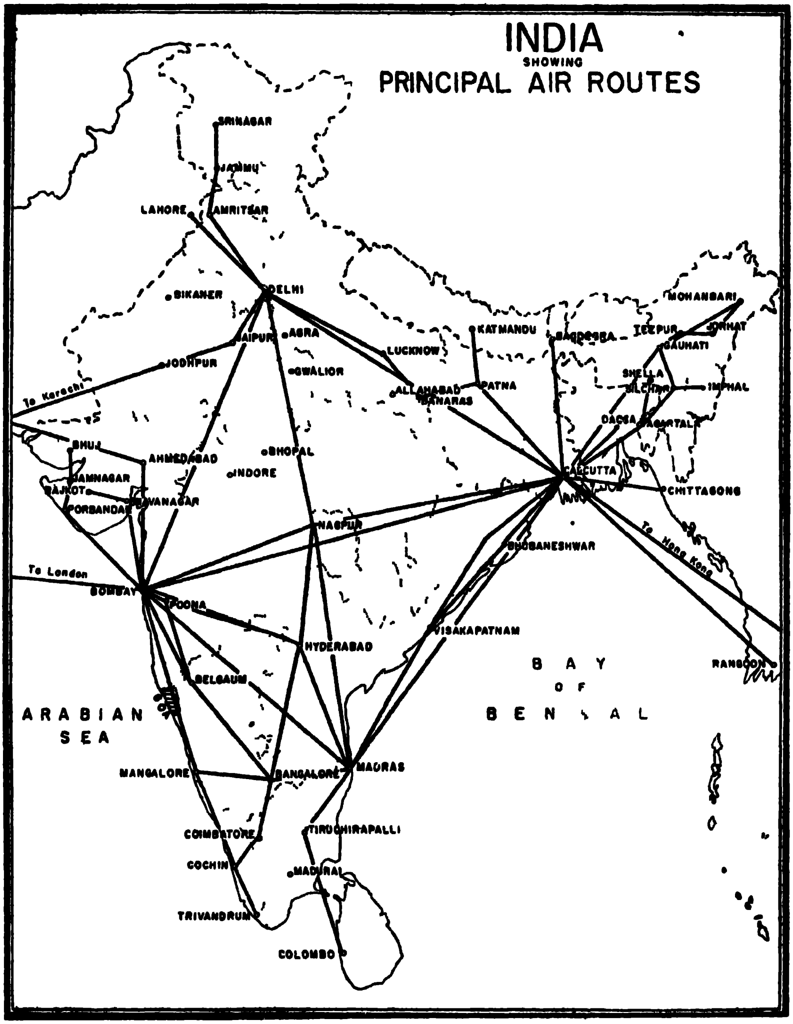


FIG 65

There are three types of air routes in India: (*a*) trans-continental trunk routes, (*b*) regional trunk routes, and (*c*) local service routes. A typical trans-continental route is one which connects Bombay with Calcutta and is linked up with foreign

and overseas air routes at Bombay and Calcutta. The regional trunk routes connect foreign and overseas routes at Bangalore, Delhi, Hyderabad, Nagpur etc. The local service routes feed regional and trans-continental routes, such as the Trivandrum-Madras line or Gauhati-Calcutta line or Delhi-Srinagar line.

The four centres of Bombay, Calcutta, Delhi and Madras are the focal points of Indian air transport, to each of which are connected other centres by local services. The selection of a centre for linking with the focus is made not only on the basis of the availability of landing ground but also on its commercial importance and possibilities of traffic.

The progress of civil aviation in the country can be judged from the following facts and figures:

		1947	1957	1960
Miles Flown (in '000)	...	9,362	23,496	25,057
Passengers (in '000)	...	255	619	824
Freight (in '000 lb)	...	5,648	85,691	75,460
Mails (in '000 lb.)	...	1,405	13,081	14,619

It should be noted that the general economic conditions of the country influence the growth and development of civil aviation. In future, therefore, further extension of air traffic will depend on the rate of economic progress. The two other factors affecting the expansion are the high cost of aviation petrol which is a vital element in the cost of operation, and the small number of industrial and business centres as compared to the size of the country.

The most important feature in the aviation of India is the *night air mail service* in Delhi, Bombay, Calcutta and Madras. *Nagpur* is the meeting place for the exchange of mails. A certain number of passengers are also taken in the air mail service.

The post-war boom in air traffic made commercial air transport operation very profitable and brought many companies into the field for operation of air services. Because of the competition and the scramble for new routes, the financial condition of most of the companies became disheartening. "The main

reason for this was that the number of operating units was larger than what was required to conduct the available volume of air transport business on an economic basis." The competing air companies could not achieve any balance between high and low revenue traffic. The Government, therefore, nationalised the air transport industry from August, 1953. With the nationalisation of air transport, the air transport undertakings were taken over by two Corporations.—Air India International and Indian Airlines. The first one is for operating long-distance international services and the second one for undertaking operations inside the country and to neighbouring States.

Bombay, Madras, Calcutta and Delhi are the principal centres from which the air routes serve different areas. Bombay services connect Madras, Colombo, Ahmedabad, Karachi, Delhi, Calcutta, Bangalore, Hyderabad, Rajkot, Belgaum and Cochin. Delhi has daily services with Bombay, Calcutta, Madras, Karachi, Srinagar, Lahore and Ahmedabad. Calcutta lines serve Bombay, Delhi, Madras, Gauhati, Dacca and a number of other cities. Madras routes connect Calcutta, Delhi, Bombay, Hyderabad, Bangalore, Cochin, Trivandrum, Coimbatore, Madurai, etc.

With the expansion of air transport in India, the need for co-ordination with other modes of transport is being felt so as to enable surface routes to act as feeders to the air services.

Prior to 1947, the external air services of India were confined to Burma and Ceylon. Indian air services now extend to Aden, Cairo, Rome, Geneva, Kabul, London, Paris, New York, Singapore, Hong Kong and Japan, as well as to Burma, Ceylon, Nepal and Pakistan.

Overseas Air Route-Pattern

India—U.K. (To London *via* Cairo, Beirut, Rome, Paris, Geneva and New York.

India—East Africa (Nairobi *via* Aden).

India—Japan (To Tokyo *via* Bangkok and Hong Kong).

India—Australia (To Sydney *via* Singapore and Djakarta).

India—U.S.S.R. (To Moscow *via* Tashkent).

TRAFFIC CARRIED BY AIR INDIA INTERNATIONAL
(in millions)

	1953-54	1959-60
Available ton-miles ...	16·91	59·52
Revenue ton-miles performed ...	10·47	34·62
Passengers carried ...	0·03	0·09

The capacity offered by the Air India International has increased to about 103·2 million ton-miles in 1960-61.

Several foreign airlines have air services in the Indian Union. These foreign lines are the following:

I. British Overseas Air Corporation (B.O.A.C.)—London-Calcutta *via* Malta, Cairo, Basra, Karachi and Delhi.

II. Trans-World Airlines (T.W.A.)—Washington-Bombay.

III. Air France—Paris-Saigon *via* Cairo, Karachi and Calcutta.

IV. Pan-American World Airways--Calcutta to New York *via* Karachi, London, Gander; Calcutta-San Francisco *via* Bangkok, Manila and Honolulu.

V. Scandinavian Airlines.

VI. Air Ceylon.

VII. Philippines Airlines—Manila-Calcutta-London.

VIII. Pakistan International Air Lines.

QUESTIONS

1. Draw a sketch map of the Indian Union, and indicate on it the principal air routes in operation within the country. Discuss possible lines of development, indicating the likely advantages to the nation.

(Delhi 1960 ; WBCS 1949 ; Cal. B.Com. 1948 ; Rajasthan B.Com. 1960).

2. Does Calcutta possess advantages for being situated on the Hooghly? Give an idea of the hinterland of this port and the principal articles of export and import. (Cal. Inter 1946).

3. Comment on the present air route pattern in India. What additional places of commercial and industrial importance would you suggest to be linked by air service? (Raj. B.Com. 1957 ; Delhi 1960).

4. "A planned and co-ordinated development of cheap water transport is one of the urgent needs of India." Discuss this statement.

5. Discuss how far the forces of economic geography have influenced the railway route pattern of India. (Delhi B.Com. 1952 ; Agra, 1951 ; Rajputana M.Com. 1955 ; B.Com. 1960).

6. Give an account of the part played by the river Ganga in the economic life of India.

7. "The meagreness of the development of roads in India remains a serious weak point in her economic structure." Explain and discuss the progress made so far in this regard.

8. What are the geographical factors affecting the competition of water and rail traffic? How far is it correct to say that in India the canals have a past but no future? (Indian Institute of Bankers 1960).

9. Discuss the part played by the railways for the commercial development of India. Do you think India should now pay more attention to the construction of roads and waterways than railways?

10. To what extent are conditions in India favourable for the development of air-transport? (Indian Institute of Bankers 1962).

CHAPTER XIV

PATTERN OF INDIA'S FOREIGN TRADE

Although India is very large in area having trade connections with many countries of the world, her share in the world trade has been very negligible. In 1958, the percentage share of India's trade in the world trade was 1·3. The highest percentage was 2·6 in 1948. In spite of her small share, India has a fairly large foreign trade and ranks sixth among the trading nations.

The foreign trade of a country is influenced by a number of economic factors—internal and external. Production, demand, government policies and industrial programmes influence the composition of export and import. India's resources are very great in certain direction. She is the main supplier of ilmenite, mica, monazite, zircon, and jute goods in the world; she has large exportable surpluses in iron ore, manganese ore, oilseeds, tea and cotton goods. On the other hand, she produces at present less than her consumption requirements of such important products as machinery, petroleum, vehicles, metals, chemicals, long-stapled raw cotton, and grains.

In view of the development projects undertaken by India under the Five Year Plans, the need for machinery, plants, metals and industrial raw materials are on the increase. Because of the depletion of our sterling balances and the limited availability of foreign exchange, the financing of these imports will have to be met by greater and greater export. Efforts are being made not only to promote export, but also to restrict import of goods which are not essential for industrial development.

Between 1948-49 and 1960-61, India's exports have risen considerably from Rs. 451 crores to Rs. 632·9 crores. Though in 1960-61, price increases were more responsible for the increased exports, the overall increases in the value of exports were mainly due to quantitative increase during the period.

It may be noted that India is not aiming at self-sufficiency in all manufactured goods but at being able to meet most of its requirements for domestic production, thus, leaving oppor-

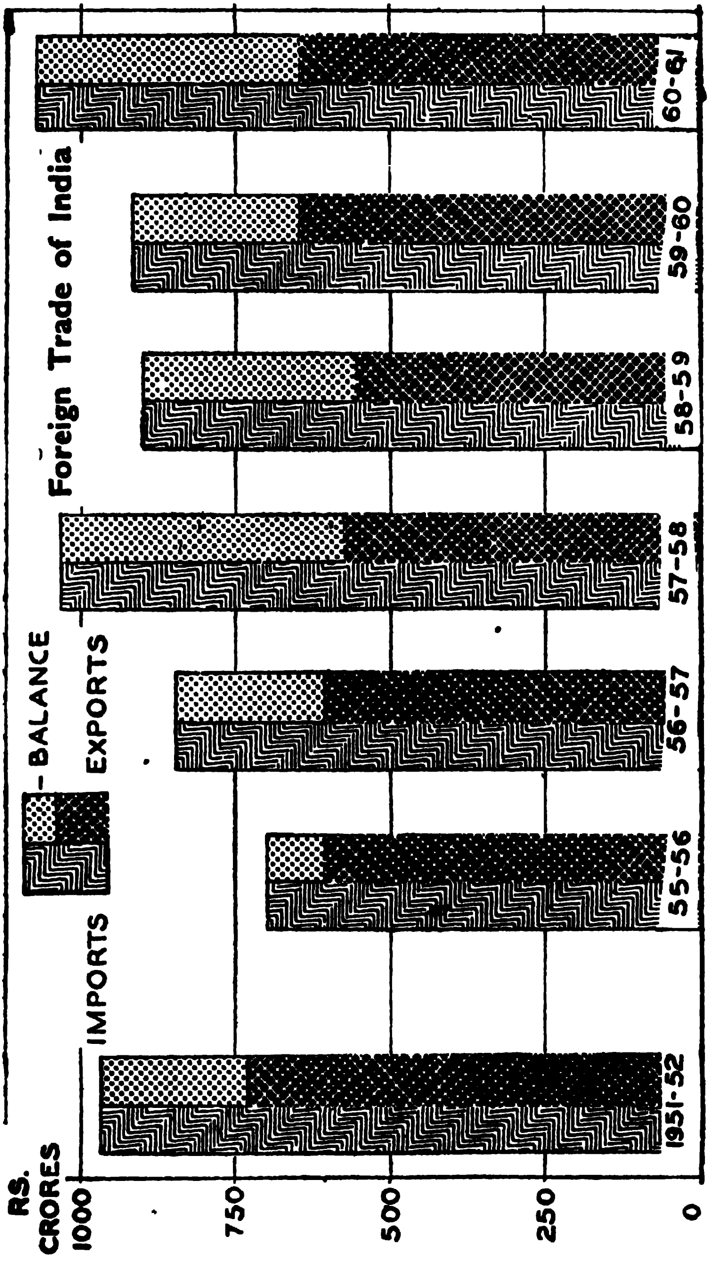

Foreign Trade of India
BALANCE
EXPORTS
IMPORTS
RS. CRORES
1000
750
500
250
0
1951-52
55-56
56-57
57-58
58-59
59-60
60-61

FIG. 66.

tunities for industrially advanced countries to supply a wide range of products to India.

The formation of State Trading Corporation in 1956 by the Government of India has added a distinct pattern to the foreign trade of India. The Corporation undertakes the task of importing goods which are in short supply or which need equalisation in prices or whose bulk procurement is advantageous or which can be obtained from State trading countries. The Corporation also arranges for exports where bulk handling and long-term contracting are advantageous or which are difficult to sell. Today, the Corporation handles about 6 per cent of India's total foreign trade.

CHARACTERISTICS OF EXPORT TRADE

1. *Traditional Exports*:

India is noted in the international markets for the export of commodities like cotton piecegoods, jute goods, tea, leather goods, tobacco, spices, mica, coffee, manganese ore and iron ore. In fact these are the *traditional commodities* for export from India.

Among commodities which are directly or largely based on agricultural production such as tea, cotton textiles, jute manufactures, hides and skins, spices and tobacco, the exports have not improved in recent years, though they still constitute the bulk of India's export.

Among the commodities whose exports are on the decline are tea, raw cotton and coal. The value of tea exported came down to Rs. 123·6 crores in 1960-61, from Rs. 129·7 crores in 1958-59.

PERCENTAGE SHARE OF EXPORTS TO PRODUCTION

Commodities	1957	1958	1959	1960
Tea ...	66	71	65·6	51·3
Cotton Cloth	16	13	17·1	14·4
Jute Goods ...	97	74	88	79·4
Tobacco ...	12	20	14	—
Iron Ore ...	48	33	27·5	32·1
Manganese Ore	104	78	75	100
Coffee ...	32	27	31·8	30·2

From the point of view of earnings of foreign exchange, agricultural commodities and related manufactures account for two-thirds of the total value of exports.

PATTERN OF EXPORTS

(in Rs. crores)

	1955-56	1959-60
1. Agricultural commodities and related manufactures ...	489·3	473·6
2. Other manufactures ..	61·0	105·0
3. Minerals	34·4	53·0
Total	584·7	631·6

Iron ore offers excellent opportunities for export but the main difficulty is the inadequate transport facilities for its movement. In the case of manganese ore, the increasing internal demand and falling prices in the world market, the prospects of exports are not bright. Though there is a considerable scope for the export of vegetable oil, the home consumption will hardly leave any substantial surplus.

The value of principal articles exported in 1960 and 1961 was as follows:

(Rs. lakhs)

Commodities	1960	1961
Textile Fabrics, made up articles, etc.	21,373	22,850
Tea	11,999	12,445
Textile Fibres and Waste ...	2,222	3,098
Raw Cotton and Waste ...	1,075	1,869
Fruits and Vegetables ...	2,460	2,650
Leather and Leather Manufactures	2,575	2,611
Iron Ore and Concentrates ...	1,613	1,806
Feeding stuff for animals ...	1,653	1,677
Spices	1,784	1,623

Commodities	1960	1961
	(Rs. lakhs)	
Crude Vegetable materials, inedible	1,595	1,613
Tobacco and Tobacco Mfrs.	1,584	1,572
Sugar	1,368	166
Iron and Steel	1,178	805
Coffee	950	670
Hides and Skins .	858	1,066
Vegetable Oils	492	991
Essential Oils, Perfume and Flavour materials ...	476	381
Fish and Fish preparations ...	436	447
Oilseeds, oil nuts and kernels	429	437

Jute manufactures constituted the largest single item of exports during 1961 and the estimated value was of the order of Rs. 144·76 crores as compared to Rs. 125·01 crores in 1960. There was also a substantial increase in the exports of sugar which stood at Rs. 13·68 crores as against only Rs. 1·66 crores in the previous year. Since the cost of production of sugar in India is higher than the world price level, its export means selling at a loss. One single item whose export is on the increase is iron ore. As against 1 million ton in 1955 and 2 million tons in 1958, the volume was 3·2 million tons in 1961-62.

2. *Prominence of new Manufactured Goods in Recent Years*:

Of late, a number of new manufactured articles are being exported from India. Though the total value of such articles is not large, they hold out possibilities of further expansion with rapid industrial development in the country. This new trend is also changing the pattern of India's export trade from being solely the exporter of raw materials. The new manufacturing items include bicycles, sewing machines, electric fans, and other engineering goods. In 1959-60, the value of new manufactured products was Rs. 25 lakhs as against Rs. 8·6 lakhs in 1955-56.

VALUE OF EXPORTS OF NEW ITEMS

(In crores of Rs.)

Items	1958	1960
Machinery	1·52	2·37
Sewing Machines	·10	·29
Electric Fans	·34	·59
Bicycles	·01	·11
Footwears	1·51	3·01
Total	12·5	25·0

The other items which are showing export performance are pig iron, soaps, paints, rubber tyres, woollen and worsted fabrics, razor blades, cigarette paper, vanaspati, medicine and pharmaceuticals.

3. *Export Promotion drive*:

The main problems of India's export trade are the disparity between internal and external prices of goods and the increasing demand within the country for goods which can be exported. In many cases, the cost of production in India is very high. Also, the scope for earning a large margin of profit on internal sales is great.

For the promotion of exports, measures like increased production at lower costs (jute, tea, fertilisers), installation of automatic looms (cotton textiles), reduction of railway freight (manganese), registration of exporters, setting up of export houses etc. are being implemented.

The Government of India seeks to create conditions in which export trade can flourish. A number of fiscal concessions have been granted in order to make Indian goods more competitive in foreign markets. These included (*i*) abolition of export duties on groundnut oil, castor oil and manganese ore, and reduction in levels of duties on raw cotton and tea; (*ii*) grant of rebate of 50 per cent on freight for a number of commodities transported by rail from interior to the ports. Reduction in freight rates have also been secured from the Shipping Conference on a number of commodities. Export promotion Councils have been set up for cotton textiles, silk and

rayon, engineering goods, chemicals, tobacco, spices, cashew, leather, plastics, sports goods and mica. There are Commodity Boards for tea, coffee and coir. Recently a Board of Trade has been established to formulate the lines on which expansion and diversification of trade should take. place. Export Promotion Councils undertake studies of foreign markets, send out trade delegations and do trade publicity abroad. They also lay down standards of quality and packing of goods for shipment abroad. The Third Five Year Plan estimates that total export earnings over the Third Plan will be of the order of Rs. 3,450 crores, an average of Rs. 690 crores per annum as compared to an average of Rs. 645 crores in 1959-60. Many countries have an out-of-date image of India as a country exporting raw materials and tropical products. It is necessary to create a new image of India as a producer of manufactured goods which maintains high standard of business integrity.

4. *A few Big Buyers of Export*:

About 50 per cent of India's exports are shared by U.K., U.S.A. and Japan. The other important buyers are U.S.S.R., Australia, Ceylon, Germany (West), Canada, Burma and Sudan.

VALUE OF EXPORTS (1959-60)

Country	In crores of Rs.	Percentage of the Total
U.K.	172·17	27·6
U.S.A.	95·41	15·3
Japan	34·41	5·5
U.S.S.R.	30·36	4·6
Ceylon	22·23	3·4
Germany (West)	19·60	3·1
Australia	19·16	3·0
Canada	15·15	2·4
Burma	12·68	2·1
Sudan	14·62	2·2
Total	622·74	100·00

In 1961-62, the shifts in the direction of India's export trade were as follows: U.K. 24·34 p.c.; U.S.A. 17·64 p.c.; U.S.S.R. 4·85 p.c.; Japan 6·09 p.c., Australia 2·42 p.c., and Canada 2·63 p.c.

U.K. has always been the best customer of Indian goods like tea, dressed leather, unmanufactured tobacco, cotton cloth and jute manufactures. Her share in the total export trade of India in 1959-60 was 27·2 per cent. In the case of tea, one of India's two major exports, the United Kingdom takes 40 per cent of the total production and two-thirds of the quantity exported. The next largest buyer of tea which is either U.S.A. or U.S.S.R. hardly takes one-eighth of this amount. The United Kingdom also takes about three-quarters of tobacco and leather goods and one-third of wool and cotton fabrics. In recent years, India has been facing keen competition in U.K. from Rhodesia for tobacco, Australia for leather manufactures and Ghana for manganese.

	1959-60 Total (Rs. crores)	U.K. Share (Rs. crores)
Tea ...	126	78
Cotton Cloth	66	14
Jute ...	110	7
Dressed Leather	28·20	20
Tobacco (unmanufactured) ...	13·90	9

From the point of view of value, U.S.A. has been the second best customer of Indian goods. In 1959-60, she accounted for about 15 per cent of the total exports of India. U.S.A. takes about 40 per cent of Indian Jute exports. The other commodities are cashew nut kernel, manganese ore, tea, and cotton piecegoods.

Japan with a share of a little more than 5 per cent of India's exports, occupies the third place among India's customers. She takes more than 70 per cent of each of the following:

Iron Ore
Raw Cotton
Manganese Ore.

The other important customers are U.S.S.R., West Germany, Canada, Sudan and Egypt. Soviet Union with which the trade was insignificant a few years ago has taken goods worth Rs. 30 crores in 1959-60.

Commodity-wise Buyers :

(*a*) *Jute manufactures :* The buyers are the U.S.A., U.K., Argentina, Australia, Canada. The U.S.A., the largest importer, takes about 40 per cent of the total jute manufactures. Jute goods, the most important of India's export commodities which account for 35 per cent of India's total earnings of foreign exchange and over 62 per cent of the earnings of hard currency, seem to be becoming more and more expensive every day. One of the main advantages of jute goods as containers lay in their cheapness. Today their prices are so high that substitutes made of paper and cotton are being used in the U.S.A. in increasing quantities.

(*b*) *Tea :* The principal buyers are the United Kingdom, the U.S.S.R., the U.S.A., Canada, Iran and Egypt. The United Kingdom remains the best customer of Indian tea, consuming as she does about 64 per cent of the exportable surplus. The high price of tea is operating against the expansion of tea export trade.

(*c*) *Hides and Skins :* The chief buyers are the U.K., the U.S.A. and Pakistan. The U.K. (67 per cent) and the U.S.A. (15 per cent) are the largest importers.

(*d*) *Oil-seeds and oils :* Linseed, groundnut and castor are the main articles. U.K. is the chief buyer of groundnut and castor. The other buyers are U.S.A., Iraq, Pakistan, Canada, Australia, Italy, Belgium, Ceylon, etc.

(*e*) *Lac :* The buyers are U.K., U.S.A. and Australia. The U.S.A. is the chief buyer.

It will be observed that India has placed too much importance on the increasing exports of primary products to industrial countries. In recent years, "the flow of goods between industrially developed and underdeveloped countries, especially the latters' exports to the former has been relatively declining, while the relative share of mutual trade among industrial countries has shown a spectacular increase."

As India's manufacturing capacity increases, a considerable

expansion of its trade with more highly developed countries may be expected.

5. *Geographical Distribution of Export Market:*

India's export markets are confined to six areas:

(*i*) *Free Trade Area:* U.K., Norway, Sweden, Switzerland, Denmark, Austria and Portugal. These six countries participate as a part of the common market through the elimination of internal barriers to trade and have not adopted a common external tariff. The area took 29 per cent of India's exports in 1959-60 of which U.K. alone accounted for 27·5 per cent. The share of U.K. has remained more or less constant at this level for a number of years.

(*ii*) *The European Common Market:* West Germany, Netherlands, Belgium, Luxemburg, France and Italy. The six countries of the coal and steel community have collectively been called "Little Europe" or "the Europe of the Six". The area has a little more than 168 million population. A reason for the creation of the common market is to unleash latent forces of growth which at present are confined in the cramped contours of small national markets. In spite of its preferential tariff system which discriminates against others, the region has become an important customer of India and took 8 per cent of India's exports in 1960-61. Germany (W) is the largest buyer of Indian goods. France was once a good customer for Indian groundnut, coffee and short staple cotton. Though exports of these commodities have fallen considerably, there are fair prospects for jute goods, cotton textiles, handicrafts, tobacco and tanned hides and skins. Belgium takes bones, animal hair, woollen carpets, jute goods, manganese, coffee, and mica. There is good scope for exporting footwear and handicrafts. India's trade with Italy is of a complementary character inasmuch as each country is mainly exporting products which the other is not producing. India exports jute, coffee, tea, manganese and spices.

(*iii*) *The ECAFE Region:* Pakistan, Burma, Ceylon, Malaya, Singapore, Indonesia, Japan and Afghanistan. In 1960, about 17 per cent of our exports was sent to this region as against 25·7 per cent in 1952. Thus the share of ECAFE in our

export trade has declined considerably, though the balance of trade is in favour of India.

(*iv*) *Rupee Payment Area:* U.S.S.R., East European countries, North Korea and Viet Nam. The trade with this region is on the increase as a result of closer trade relations. In 1959-60, its share was 9 per cent as against 3 per cent in 1948 in the total exports from India. There is scope for further expansion of Indian exports to this area in respect of spices, hides and skins, mica, tobacco, handicrafts, manganese, coffee and cashew nuts.

(*v*) *The African Region:* Nigeria, Kenya, Sudan and Egypt are the best customers of this region, which took goods worth Rs. 32 crores in 1959-60. The possibility of expanding the export of non-traditional goods in this area is vast.

As regards exports nearly 15% of India's tea goes to the Afro-Asian countries. More than one-fifth of our total exports of jute manufactures and cotton piecegoods are also absorbed by these countries. Apart from the conventional export items, *viz.*, tea, jute manufactures and cotton piecegoods, in the last few years India has offered a wide range of newly manufactured goods such as light engineering products, pharmaceutical and chemical manufactures, footwear, vanaspati, art silk piecegoods, carpets and rugs, etc.

(*vi*) *Other countries:* U.S.A., Australia and Canada took goods worth Rs. 129 crores (about 21 per cent) of our total exports in 1959-60. In the same year, U.S.A. took 16 per cent of our total exports.

Characteristics of Import Trade

During the last 30 years, the composition of India's import trade has undergone certain distinct changes. Till 1930, India had enjoyed a favourable balance of trade and her imports consisted of manufactured goods which came mostly from U.K. and her Empire. Between 1930 and 1938, owing to the expansion of output of domestic industry, there was considerable decline in the import of cotton textiles and sugar, and increase of food-grains and other consumers' goods. The period after 1947 saw several measures for the restriction of imports in particular, of consumers' goods by encouraging indigenous industries in the country.

IMPORTS OF PRINCIPAL COMMODITIES

(Rs. lakhs)

	1958	1959	1960
Imports—			
Machinery of all kinds	188,92	205,83	232,74
Iron and Steel	97,80	85,11	110,83
Oils—Vegetable, mineral and animal	80,28	82,93	83,76
Chemicals, drugs and medicines	65,28	88,32	86,09
Electrical goods and apparatus	49,04	54,16	53,62
Vehicles (excluding aircraft, ships and boats)	52,53	61,99	51,00
Cotton, raw and waste	30,66	34,77	75,15
Fruits and vegetables	17,43	16,52	18,83
Paper, pasteboard, etc.	8,26	9,59	12,20
Dyes and colours	8,76		12,20
Spices	2,84	2,52	12,19
Woollen and worsted fabrics	30	23	
Cotton fabrics	1,05	1,19	23
Rice	44,02	11,42	79
Wheat and Spelt	102,65	134,93	18,66
Total Imports .	86,400	94,000	103,510

India's imports at present are mainly related to the developmental items and essential raw materials and articles like food. Imports of raw materials will continue while those of manufactures will show a downward trend in the future pattern of India's import trade.

BREAK UP OF IMPORTS (VALUE IN RS. CRORES)

	1958-59		1959-60		1960-61		1961-62	
	Value	P.c.	Value	P.c.	Value	P.c.	Value	P.c.
Capital goods	125	15	126	14	153	14	165	16
Industrial goods	477	59	567	61	669	63	687	65
Consumers' goods	250	29	241	26	244	23	198	19

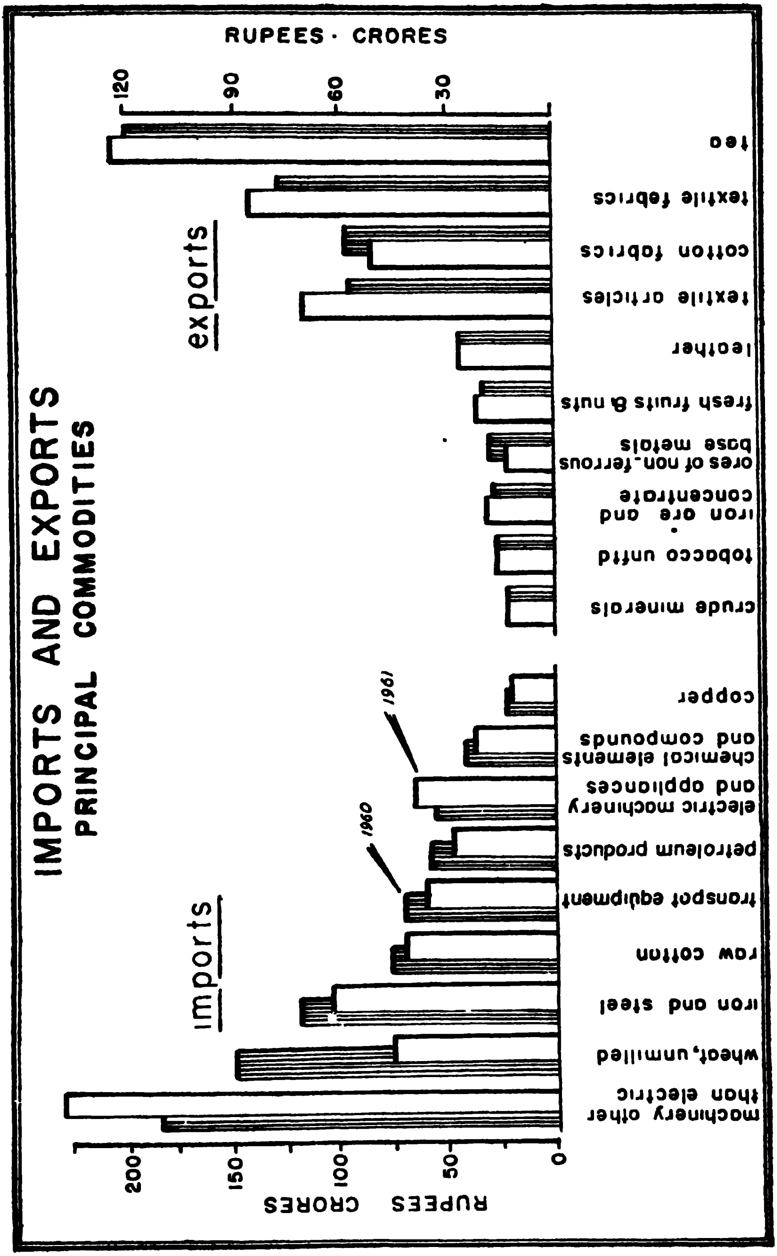

IMPORTS AND EXPORTS
PRINCIPAL COMMODITIES
RUPEES · CRORES
120
90
60
30
exports
tea
textile fabrics
cotton fabrics
textile articles
leather
fresh fruits & nuts
ores of non-ferrous base metals
iron ore and concentrate
tobacco unmfd
crude minerals
imports
1960
1961
copper
chemical elements and compounds
electric machinery and appliances
petroleum products
transport equipment
raw cotton
iron and steel
wheat, unmilled
machinery other than electric
200
150
100
50
0
RUPEES CRORES

FIG. 67.

1. *Predominance of Machinery and Equipment :*

In the present composition of imports, commodities like raw materials, non-ferrous metals, mineral oils and machinery figure prominently because of the rapidly developing economy. Such raw materials and components are essential for the maintenance of production. There are considerable restrictions on imports of items which are being manufactured in the country or the production of which has expanded recently.

Imports are considerable in respect of machinery, base metals and petroleum products, which together account for 50 per cent of the total import value. Most of the industries in the private sector, particularly jute, sugar and cotton textile mills are bringing about replacement of obsolete machinery. In the public sector, too, machinery and equipment are being imported for new industries. In 1961-62 the imports of machinery and transport equipment cost Rs. 345 crores out of the total imports, valued at Rs. 1,070 crores.

2. *Decline in the import of Raw Materials and Consumers' goods*

With the partition of India, it became necessary to import large quantities of raw cotton, raw jute, raw rubber and raw wool to meet the internal requirements. Because of the vigorous efforts which the country made to increase the domestic production, the imports of these commodities have considerably declined. From Rs. 58 crores for raw cotton in 1955, the amount was reduced to Rs. 30·6 crores in 1958. In jute, India has almost become self-sufficient. There has been a considerable decline in the imports of consumers' goods, more particularly those in which India's production has caught up with the domestic demand.

VALUE OF IMPORTS

(In Rs. lakhs)

		Consumer goods	Raw materials
1951-52	...	241,06	360,81
1960-61	...	212,01	381,00
1961-62	...	125,20	365,58

3. *Dependence on Imported Food-grains :*

In spite of the expansion of agricultural areas and production, the dependence on foreign supplies is continued. Fresh agreements have been entered into with U.S.A. for the import of rice and wheat, Canada and Australia for the import of wheat and Burma for the import of rice. In 1959, India imported 3·8 million tons of food grains compared to 1·4 million tons in 1956.

IMPORT OF CEREALS

('000 tons)

	Rice	Wheat	Others	Total
1956	325	1,095	--	1,420
1958	390	2,674	109	3,178
1959	209	3,497	20	3,807
1960	688	4,317	51	5,056

4. *Geographical Distribution of Imports :*

U.K., U.S.A. and West Germany account for more than 50 per cent of India's imports. It is interesting to note that U.S.A. which was India's second best source till 1958 is now the first in importance.

SOURCES OF IMPORTS INTO INDIA BY COUNTRIES

(In crores of Rs.)

	1955	1957	1959	1962
U.K.	160·2	238·5	172·7	194·52
U.S.A.	88·7	170·3	195·4	233·51
West Germany	53·7	122·8	118·7	118·21
Japan	31·0	54·4	40·9	58·61
Italy	16·0	30·0	25·8	23·68
Saudi Arabia	15·0	41·0	20·0	18·90
Canada	6·0	13·0	22·0	16·61
Total Import .	670·05	1,028·67	887·38	1,071·17

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India's import from Canada is on the increase. U.S.S.R. is an important seller to India inasmuch as the import increased from Rs. 3 crores in 1955 to Rs. 16 crores in 1959. There is noticeable increase of imports from Sweden and Iran. Import from Pakistan has come down to Rs. 5·4 crores in 1959 from Rs. 25 crores in 1955.

From the point of view of India's import trade, the Afro-Asian countries occupy a pivotal position in the supply of certain items, such as crude petroleum, raw cotton, manila hemp, rock phosphate, dates and cloves. More than 50% of our imports of important non-ferrous metals like copper and zinc are also from this region. In the case of commodities like raw cotton nearly two-fifths of our total imports come from these countries.

Commodity-Wise Sellers

India's growing manufacturing capacity enables certain imports to be replaced by domestic products. Among the many industries in which manufacturing capacity has been installed or expanded during the First and Second Plan periods, are the manufacture of medicinal and pharmaceutical products, internal combustion engines, electric cables, locomotives and cycles. The examples of jute spinning machinery and cement making machinery are typical of changes in many items of trade where domestic production is replacing imports.

(*a*) *Machinery*. The chief suppliers are U.K., Germany, U.S.A., Japan, France, etc. The U.K. is the largest supplier. The machinery includes textile machinery, internal combustion, diesel, machine tools, power generating machinery, agricultural machinery and tractors, paper mill, pulp machinery and electrical machinery. The following figures give India's imports of machinery and mill work from various sources along with percentage share of each country in the total imports of this item:

Country		1955 P.c.	1962 P.c.
U.K.	...	54%	37%
West Germany	...	15%	24%
U.S.A.	...	15%	29%
Other countries	...	16%	10%

(*b*) *Transport equipment* · The U.K., the U.S.A., Canada, Germany, Italy and France. The equipment includes railway locomotives, buses, trucks, lorries, passenger and road vehicles etc.

(*c*) *Mineral Oil :* Iran, Iraq, Saudi Arabia, Burma, Indonesia and the U.S.A.

(*d*) *Paper and Pasteboard* · The U.K., Germany, Sweden, Norway, the U.S.A.

(*e*) *Art Silk Manufactures* · Japan, China, Italy, the U.K., etc. Japan sends 73 per cent in normal times.

(*f*) *Chemicals :* U.K., Germany, Japan and the U.S.A.

(*g*) *Raw cotton :* Egypt, the U.S.A. Kenya and Pakistan.

(*h*) *Grains and flour :* Canada, Australia, Burma, the U.S.A., Argentina, Thailand and Egypt.

Balance of Trade

The difference between the value of export and import is known as the balance of trade. When India's exports exceed her imports, the balance is said to be in India's favour. Before the partition, an excess of export was always noticeable in India's trade figures. After the partition, the traditional surplus trade balance has now become adverse.

(In crores of Rs.)

Years		Import	Export	Balance
1955-56	.	704·81	609·41	– 95·40
1956-57	...	832·45	615·52	– 219·93
1957-58	..	993·58	621·31	– 372·27
1958-59	...	856·00	580·30	– 275·70
1959-60	...	887·00	616·00	– 271·00
1960-61	...	1,070·10	642·79	– 422·01
1961-62	...	1,071·17	661·99	– 409·18

India's balance of trade with different countries is a constant changing feature. Currently, India has a favourable

balance of trade mainly with East Germany, Australia, Ceylon, Canada, Burma, Argentina and Indonesia. The balance is *now* unfavourable mainly with U.K., U.S.A., West Germany, Italy, Belgium and Pakistan. India's balance of trade with U.S.S.R. in 1961-62 was unfavourable to the extent of Rs. 5 crores. It may be noted that this balance was in favour of India from 1958 to 1961.

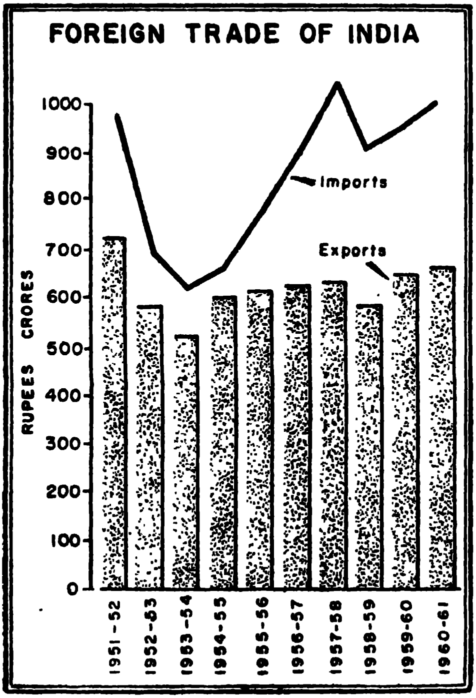


FIG. 68.

A special feature of the foreign trade of India is the extremely small proportion of its *land frontier trade.* The present barriers against land trade are in the shape of mountains and deserts which cannot be easily crossed. The other difficulties are tariff barriers and exchange complications. With the growth of communications, this trade with China, Russia, Nepal, Pakistan, Burma, etc., should develop further. The principal commodities that are imported by India are grains, jute, fruit, raw wool, living animals and raw silk. The exports are cotton goods, sugar, tobacco, leather, tea, silk goods, salt etc. In 1959-60, the value of export by land was about Rs. 6 crores, and the value of import was about Rs. 30 crores.

INDIA'S TRADE RELATION WITH CERTAIN IMPORTANT COUNTRIES

The United Kingdom. The most important feature of the direction of India's foreign trade is the fact that it is dominated

by the U.K. both in imports and exports. U.K.'s share in the exports from India amounts to 28 p.c. and in imports in India about 20·6 p.c. In other words, U.K. takes more than one-fourth of India's exports and supplies about one-fifth of imports. The principal exports to the U.K. are tea, jute, hides and skins, oil-seeds, raw cotton, raw wool, metals and ores. Tea alone accounts for more than fifty per cent of the value of total exports to the U.K. Thus, India's exports to U.K. are limited to a few commodities. On the import side, the chief articles are machinery and mill-works, iron and steel, chemicals, instruments, hardware, liquors, motor cars, rubber manufactures, paper and paste board, etc. India receives about 4·5 per cent of the total exports of U.K. and ranks seventh as a market for British goods. Machinery accounts for about 37 per cent of our imports from U.K. In fact, India is the third largest customer of British machinery.

PRINCIPAL EXPORTS (£ thousand) TO INDIA

		Full Year	
	1955	1957	1959
Total All Exports ..	130,165	176,415	171,272
Of which:—			
Machinery other than electric	32,340	45,502	54,358
Electric machinery, apparatus and appliances ...	16,264	21,973	20,669
Wool & other animal hair & tops	4,819	6,087	3,838
Petroleum and petroleum products	1,735	2,266	2,329
Chemicals	16,528	16.561	15,674
Iron & steel	8,795	13,280	12,732
Non-ferrous base metals ..	2,251	3,105	2,834
Manufactures of metals ...	6,994	17,262	9,852
Railway vehicles ...	3,366	5,559	3,745
Road vehicles & aircraft ...	10,025	21,037	26,732
Scientific instruments; photographic & optical goods; watches and clocks	2,975	2,846	2,944

In 1961, the total British exports to India was valued at £151·7 million of which machinery other than electric accounted for £42·5 million, electric machinery for £13·5 million, Chemicals for £13·7 million and road vehicles and aircraft for £14·6 million.

PRINCIPAL IMPORTS (£ thousand) FROM INDIA

	Full Year 1955	1957	1959
Total All Imports ...	158,956	157,571	142,625
Of which:—			
Tea	75,499	84,342	65,127
Leather, leather manufactures and dressed furs ...	12,618	13,348	13,662
Tobacco and tobacco manufactures	7,163	7,141	8,118
Wool & other animal hair & tops	4,898	4,576	2,882
Crude fertilisers and crude minerals, excluding fuels	1,976	2,243	1,764
Metalliferous ores and metal scrap	2,444	4,559	2,450
Miscellaneous animal and vegetable crude materials	4,945	4,370	3,397
Animal & vegetable oils, fats, greases & derivatives ...	8,487	3,743	1,954
Cotton yarns & woven fabrics	7,037	9,965	10.669
Miscellaneous textile manufactures	14,386	12,105	11,349

In accordance with the system of Commonwealth preference, the United Kingdom allows the unrestricted duty-free entry of almost all goods imported from India. Because of an acute shortage of foreign exchange, India controls nearly all imports

by the Import and Export (Control) Act, granting tariff preferences to some of the goods imported from the United Kingdom. Early in August, 1961, the United Kingdom made a formal application for joining the European Economic Community known as the European common market.

If Britain is to become a member of the European Common Market, the benefits of preferential entry into U.K. which India along with other countries of the Commonwealth enjoys will not continue. The abolition of preferential entry into U.K. and the gradual application of E.C.M.'s common external tariff is bound to affect India's exports of tea, jute, spices, cotton textiles and other manufactured goods for which U.K. is our customer, unless there are proper safeguards by agreement between India and E.C.M. These safeguards should include dropping of 18 per cent external tariff on tea, freedom of entry into E.C.M. for spices and cashew nuts, reasonable terms for jute goods, postponement of external tariff for cotton textiles or some special safeguard and reduction of external tariff rate in the case of other manufactured goods. In the absence of such safeguards, Britain's entry into E.C.M. will be a threat to the Indian economy.

In the case of U.K.'s imports of manganese ore India is no longer the most important supplier. The other sources of U.K.'s imports of manganese ore are Ghana and Soviet Union. U.K.'s imports of raw cotton from India mainly comprise cotton of $\frac{7}{8}''$ staple and under. India is the most important supplier of this type of cotton to U.K. followed by Pakistan. With regard to tea, India's competitors in U.K. are Ceylon, Rhodesia, Nyasaland and Pakistan. Total British imports from India in 1961 were valued at £144·9 million of which tea accounted for £62 million, leather and manufactures for £11 million, cotton yarn and woven fabrics for £12·9 million and oilseed cake and meal for £10·9 million. The value of tea has come down by about £22 million in 1961 from 1957. It may be noted that India's exports to U.K. consist of mainly traditional items, though of late non-traditional items like chemicals and machinery, are becoming significant.

Pakistan. Indo-Pakistan trade is regulated by an Agreement of March 1960 with a protocol which replaced the Agreement of 1957. The volume and value of trade between India

and Pakistan were at its maximum in 1948-49 when India imported goods worth Rs. 107 crores and exported goods worth Rs. 75 crores. Since then, the volume of trade between the two countries is on the decline reaching the record low value of about Rs. 11 crores in 1959. The general industrial development in Pakistan, the fashioning of her import policy to meet her requirements of economic development and the attempt to diversify the pattern of her trade influence the pattern of Indo-Pakistan trade. Because of the changes that are taking place in the economy of Pakistan, there is greater scope for export of consumers' goods to East Pakistan and iron and steel, machinery and building materials to West Pakistan.

The following table shows India's share in Pakistan's total imports as well as the trend of India's exports to Pakistan:

	1958	1959	1960
Pakistan's total imports	188,78	168,10	311,20
Imports from India of which:—	8,99	6,81	11,37
Non-ferrous metals and manufactures ...	69	2	1
Coal	5,03	3,34	2,08
Machinery of all kinds	28	16	58
Drugs and Medicines ...	21	20	23
Building materials .	24	13	N.A.
Spices	16	20	N.A.
Glass ware	4	5	N.A.
Dyeing and Tanning materials	—	2	7

The important articles of import from Pakistan are raw jute, raw cotton, wood, betel leaves, fish, betel nuts, rock salt, food-grains, fruits and vegetables. The value of imports from Pakistan has declined from Rs. 29 crores in 1952 to Rs. 14 crores in 1962.

Burma. Imports from Burma consist largely of rice, beans and pulses, teak, rubber and precious stones. These represent more than 85 per cent of the total imports from Burma. More than 40 per cent of our exports to Burma consist of cotton and jute manufactures. Other exports are iron and steel, tea, sugar, coffee, agricultural products, engineering and electrical goods, chemicals and pharmaceuticals, handicrafts, etc. India entered into a trade agreement with Burma in 1956 for a period of 5 years. India has today an unfavourable balance of trade with Burma.

INDO-BURMA TRADE

(In lakhs of rupees)

	Imports	Exports
1952	... 31,08	23,49
1956	... 5,71	10,18
1958	... 45,54	7,48
1959	.. 13,17	12,68
1960	. 19,51	6,94
1962	... 10,64	5,31

Ceylon. The important items of imports into India from Ceylon are: copra, cocoanut oil and tobacco. Unhusked rice, cotton piece-goods, fish and coal are the important items of exports from India. Ceylon is India's second best customer of coal. Other important items of exports to Ceylon are pulses, fruits, and vegetables, chillies, oil-cakes and manures.

A Trade Agreement between India and Ceylon was entered into in January, 1958 in accordance with which India would import specified quantities of Jaffna chewing tobacco at a concessional rate of import duty. On the other hand, Ceylon would provide facilities for the import of Indian tobacco for the production of cigarettes.

India has had a favourable balance for many years in her trade with Ceylon.

INDO-CEYLON TRADE

(In lakhs of rupees)

	Imports	Exports
1956	4,53	20,28
1958	9,41	19,79
1959	7,91	22,23
1960	3,92	18,48
1962	4,42	17,11

Japan. Commercial relations between India and Japan are regulated by an agreement of 1958. Imports into India from Japan are cotton manufactures, artificial silk and silk manufactures, iron and steel, machinery and mill-work, ships, railway equipment, industrial machinery, drugs and medicines, dye-stuffs and newsprint, The principal items of India's exports to Japan are raw cotton, pig iron, manganese, mica, tobacco, sugar, hides and skins, coal and tanning materials. Raw cotton usually constitutes more than a quarter of Japan's total imports of foreign goods.

INDO-JAPAN TRADE

(In lakhs of rupees)

	Imports	Exports
1956	30,11	43,27
1957	27,21	54,42
1958	25,77	39,66
1959	34,44	40,96
1962	58,61	40,33

West Germany. Of European Common Market countries, West Germany is by far the most important customer of Indian goods. In 1960, the value of India's exports to West Germany was Rs. 18·5 crores compared to Rs. 14·7 crores in 1958. She absorbs about 40 per cent of India's total exports to E.C.M. The commodities are undressed goat and sheep skins, jute bags and jute fabrics, coffee, oil-cakes, tea, mica, seed lac and shellac, iron

ore and concentrates, cashew kernel, manganese ore, spices, pepper and cardamoms, bones and raw wool. In normal times, imports from Germany into India consist of iron and steel, brass and copper, hardware, machinery and mill-works, glass and glassware, dyes, electrical instruments, liquor, scientific and surgical instruments.

In the case of India's foreign trade Western Germany has come to occupy the third place—behind only U.K. and the U.S.A. The balance of trade, however, has been continuously against India during the last few years.

INDO-GERMAN TRADE

(In lakhs of rupees)

	Imports	Exports
1951-52	28,56	936
1954-55	40,68	15,23
1956-57	90,00	14,61
1958-59	111,87	19,61
1960	113,00	18,50
1962	118,21	20,68

The most important item of import from Germany is machinery and mill-work. It accounts for as much as 30 to 35 per cent of total imports from Germany. In recent years Germany has been able to replace the U.S.A. as the second big supplier of machinery and mill-work of India. The trade between the two countries is regulated by trade agreements under which both Governments facilitate the import and export of all commodities from either country.

United States of America. India long enjoyed a favourable balance of trade with the U.S.A. Of late, however, India's imports have gone in excess of exports to the U.S.A. Although U.S.A. spent nearly 15 billion for imported goods in 1960, India's share was a mere 1·5 p.c. The principal items of exports from India to the U.S.A. are jute and jute goods, shellac and lac, cashew nuts, tea, hides and skins, carpet, wool, leather, undressed furs and mica. These and other traditional commodities constituted 96 per cent of U.S. imports from India in 1949. In 1960, however, their share had gone down to 83 per cent but

total imports from India increased by new and non-traditional items.

U.S.A. IMPORTS FROM INDIA: YEAR 1960

Commodity	Quantity	Value (in million $)	% of total U.S. imports	% of total Indian exports
Jute goods	856 m. yds.	86·5	84	40
Cashew nuts	59,000 lbs.	25·9	90	11
Tea	24·8 m. lbs.	13·9	22	11
Manganese	441,000 tons	13·7	20	6
Lac and Shellac	313 m. lbs.	14·8	64	
Spices	25 m. lbs.	10·3	41	
Castor oil	—	7·2	47	
Lemon grass oil	—	2·0	74	
Goat skins	7 m. lbs.	6	27	
Woollen rugs	1·9 m. lbs.	2	—	

U.S. imports of India's shrimps, leather goods, vegetable oils, coffee, rubber manufactures, cotton, woollen and silk manufactures, precious stones, brass and bronze articles, drugs and medicines, toys, books, art works and antiques, have increased appreciably in recent years. There is considerable interest in U.S.A. for India's new products like sewing machines, fans, castings, machine tools and even diesel engines as their production in U.S.A. involve higher cost in labour.

INDO-U.S.A. TRADE

(In lakhs of rupees)

	Imports	Exports
1950-51 ...	120,23	110,14
1953-54 ...	79,43	89,98
1956-57 ...	105,26	89,49
1958-59 ...	195,43	95,41
1961-62 ...	233,51	116,75

India imports from U.S.A. wheat, machinery, chemicals, textiles, petroleum and petroleum products and metal manufactures.

Afro-Asian region. India's trade with the countries in the *Afro-Asian region,* though individually small, is cumulatively sizeable. In 1961-62 out of the total imports of India amounting to Rs. 1,071 crores, the share of the countries in the region amounted to Rs. 230 crores, that is nearly 25%. The percentage share of Asian countries was 20·5% and of African countries 5%. Of the total value of India's exports of Rs. 662 crores in 1961-62, the offtake of the Afro-Asian countries amounted to Rs. 166 crores, that is about 25%. The share of Asian and African countries was 20% and 5% respectively.

India's Trade Agreements. India has concluded trade agreements with several countries to meet her growing requirements for the expansion of export trade. The main objectives of the trade agreements are: (*i*) diversification of trade, (*ii*) establishment of direct relations with countries receiving Indian goods indirectly, (*iii*) promotion of trade with countries having controlled economy and (*iv*) operating a rupee payment account for meeting the exigencies of the foreign exchange situation. These agreements are of two kinds: (*a*) committing the parties to specific quantities of export, (*b*) envisaging the exchange of letters of commercial goodwill. In 1961 India had trade agreements with 25 countries of which the important are Czechoslovakia, Finland, West Germany, Hungary, Pakistan, Poland, U.S.S.R., Yugoslavia, U.A.R., Rumania, Viet-Nam and Burma.

India's trade with a number of newly independent African countries, such as Cameroon, Central African Republic, Chad, Dahomey, Gabon, Guinea, Ivory Coast, Mali, Niger, Senegal, Sierra Leone, Somalia, Togo and Upper Volta is small. Among the Asian countries the volume of our trade is low with countries like Cambodia, North and South Korea, Laos, Mongolia, North Viet-Nam and Yemen. India has been making efforts to develop her external trade with all countries of the world including the newly emergent countries. Already she has concluded trade agreements with several countries in the region, including Afghanistan, Burma, Ceylon, Iran, Iraq, Japan, Jordan, Morocco, Nepal, North Korea, Pakistan, Tunisia, United Arab Republic and North Viet-Nam.

India has also a large **Entrepot Trade.** The entrepot trade of a country consists of the re-export of articles previously imported. In other words, a country which imports things with

a view to exporting them is known to have entrepot trade. India occupies a very favourable geographical situation for the purpose of doing entrepot trade as she is at the centre of the Eastern Hemisphere.

From the West, cotton, chemicals, machinery, minerals and metals are imported for distribution to countries like Kenya, East Africa, Malaya, Indonesia and Viet-nam.

COUNTRIES WHERE GOODS ARE RE-EXPORTED

(In lakhs of rupees)

	1951	1957		1951	1957
U.S.A. .	524	125	Egypt ..	13	14
U.K. ...	466	105	Australia ..	41	18
Burma	45	13	U.S.S.R	3	18
Ceylon ..	43	31	Czechoslovakia	53	17
Aden .	3	14	Hungary	1	38
Saudi Arabia .	10	11			

There is a large volume of *coastal trade* in India. The ports along the Indian coast are located in West Bengal, Orissa, Madras, Kerala, Maharashtra and Gujarat which handle trade for their respective States as well as other States of India. In the coastal trade, the share of foreign merchandise is hardly 10 p.c. of the total. In 1957, the different coastal ports imported from other States goods valued at Rs. 379 crores against the value of exports at Rs. 343 crores. The *minor ports* of India play a vital part in the coastal trade of India.

Inter-regional Trade. Because of the vastness of the country, its varied climate and diverse natural resources, India has a gigantic volume of *inter-regional trade,* where, in addition to railways and motor vehicles, bullock carts and country boats share a large percentage of traffic.

The following commodities are important in the inland trade: Coal and coke, raw cotton, cotton piecegoods, rice, wheat, raw jute, iron and steel products, oilseeds, salt and sugar.

The value of inland trade has been estimated at Rs. 7,000 crores. The factors which govern the value of total trade between regions depend on the composition of their respective resources and the distance.

QUESTIONS

1. What are the characteristic features of the foreign trade of India? What changes have taken place in the items of our exports and imports after *Partition*? (Agra B.Com. 1951).

2. Analyse the nature and direction of U.K. trade with Indian Union. What do you think of the effect on India's export if U.K. joins the Common European markets?

3. Describe the nature of the present-day trade between India and U.S.A. How far do you think this trade admits of development? (Cal. B.Com. 1943 ; Delhi U. 1949 ; Delhi B.Com. 1952).

4. To what extent is the Indian Republic dependent on Pakistan for the supply of raw materials? Are there alternative sources available for such goods? (Cal. B.Com. 1953 ; Delhi U. B.A. Hons. 1950 ; Agra 1953).

5. Describe the trade which India carries on with other countries by land route. What are the countries which participate and the commodities which enter in this trade?

6. Discuss the prospects of our exports to Africa and Middle East.

7. Give a short informative note on India's sources of imports and destination of exports.

8. What are the features of the foreign trade of India with regard to (*a*) balance of trade, (*b*) direction of trade and principal items of exports and imports? (Cal. B.Com. 1960).

9. Describe the pattern of India's foreign trade with regard to composition and distribution of imports and exports. What are the further prospects of our exports to the U.S.A.? (Rajasthan B.Com. 1961).

10. Examine the present pattern of foreign trade of India. Do you envisage any major change in it in the near future? (Delhi B.Com. 1963)

CHAPTER XV

PORTS AND TRADE CENTRES

Progress of a country may be judged by the growth in the number of its cities. In India the great majority of the people derive their livelihood from agriculture. Consequently, there is a great variation in urban and rural population. About 17 per cent of the total population live in the cities or in the suburban districts of India. A town in India means a collection of houses inhabited by not less than 5,000 people. A city is a town with over 100,000 inhabitants.

There are only 80 cities in India with a population of more than 100,000.

NUMBER OF CITIES IN THE DIFFERENT STATES

Bihar	7	Madhya Pradesh	8
Kerala	4	Orissa	1
Kashmir	2	Punjab	5
Gujarat	6	Rajasthan	6
Maharashtra	11	U.P.	17
Madras	9	West Bengal	12
Mysore	6		

It will thus be observed that largest number of cities with 100,000 and above population in each are in U.P., West Bengal and Maharashtra. Not only is population increasing in these cities, but also many towns are becoming cities.

Most of the cities in India have grown rapidly as a result of migration from the countryside. This migration has not been influenced by industrialisation. Rural population pressure and conditions of insecurity in rural areas are the main causes. The rate of urbanisation is now faster than the rate of industrialisation. "Most of the rural migrants are unskilled labourers who create a glut in the labour markets of the cities. Unused to the discipline of the factories, they become an unstable labour force flitting in and out of the factory between the town and the countryside."

SOME IMPORTANT TOWNS WITH POPULATION OF 100,000 AND OVER

(Based on 1961 census)
(in '000)

Towns	Population	Towns	Population
Calcutta	... 5,560	Salem	... 250
Howrah	... 514	Tiruchirapalli	... 249
Ahmedabad	... 1,156	Bareilly	... 273
Bombay	... 4,146	Kharagpur	... 147
Poona	... 721	Aligarh	... 183
Sholapur	... 337	Meerut	... 283
Madras	... 1,725	Moradabad	... 198
Madurai	... 424	Saharanpur	... 185
Agra	... 509	Shahjahanpur	... 117
Patna	... 362	Jullundur	... 221
Varanasi	... 490	Ludhiana	... 244
Kanpur	... 948	Gaya	... 151
Lucknow	... 662	Jamshedpur	... 332
Allahabad	... 431	Jabalpur	... 336
Amritsar	... 375	Ajmer	... 230
Nagpur	... 643	Baroda	... 295
Delhi	... 264	Bhavnagar	... 177
Bangalore	... 1,208	Bikanir	... 150
Hyderabad	... 1,252	Jaipur	... 402
Indore	... 395	Jodhpur	... 224
Mysore	... 253	Kolar (Gold-field)	... 146
Bhatpara (Bengal)	... 147	Gwalior	... 300
Surat	... 288	Trivandrum	... 240
Coimbatore	... 285	Cuttack	... 146
Hubli	... 170		

Principal Ports

A modern port is in effect an important junction or point of transfer in overseas trade, either for a further voyage or to land transport—more particularly, of course, by rail, but also by inland water channels, whether natural or artificial and now by road to a constantly increasing extent.

The fundamental importance of a port consists in the extent and productiveness of its hinterland. Hinterland means a

region to which a port acts as a "door". The extension of facilities of transportation determines the size of a hinterland while the productivity is measured by its products and density of population.

There are two classes of ports in India : major and minor. "The sheltered nature of a port, the well-laid-out approach channels, the provision of docks, jetties and moorings, the well-laid-out transit sheds, the effective rail connections, the ability to serve a very large portion of the hinterland lying behind the port, the facilities for meeting the requirements of defence and strategy, the comparatively large volume of traffic and the possibilities of work for shipping all the year round, usually distinguish a major port from a minor port." The major ports of India are Bombay, Cochin, Madras, Visakhapatnam, Calcutta and Kandla. With the liberation of Goa, the prospects of Panjim becoming a major port are bright.

India has over 150 minor ports of which the following are considered more important: Kakinada, Masulipatam, Cuddalore, Kozhikode, Mangalore, Tuticorin, Alleppey, Bhavnagar, Porbandar, Bedi Bandar, Broach, Ratnagiri, Okha, Quilon and Surat. The minor ports handle about 6 million tons of traffic every year. There are projects to develop Mangalore and Tuticorin as major ports.

India is a vast country with a coast-line of about 3,500 miles. Unfortunately, her coast-line has few indentations and consequently she has only a few major ports of trade. The southern side is deficient in harbours to accommodate the large vessels now employed in sea-borne trade. The violence of the monsoon keeps the ports of the western coast of India, with the exception of Bombay, Kandla and Cochin, closed to traffic from May to August. Then, again, the eastern coast is surf-bound and consequently requires constant dredging.

Of the total sea-borne trade of India, more than 85 per cent is shared by Bombay, Calcutta, Cochin, Madras and Visakhapatnam. The average ship-borne traffic in India is 35 million tons per annum and the total optimum handling capacity of the major ports is hardly more. Any increase in trade results in congestion at the ports. The position of the different ports in respect of yearly turnover is more or less as follows:

CARGO HANDLED AT MAJOR PORTS

(000 metric tons)

	1955-56		1960-61	
	Import	Export	Import	Export
Calcutta ...	3,464	4,696	5,580	4,073
Bombay ...	6,814	3,657	10,858	3,962
Madras ...	1,862	638	2,162	926
Visakhapatnam	232	1,112	1,386	1,463
Cochin .	1,241	394	1,647	393
Kandla ...	208	105	1,251	347
Total ...	13,281	10,602	22,884	11,164

The concentration of India's ocean-borne trade in these major ports results from a number of causes. Geographical causes are, no doubt, important, but the more important is the historical one. Bombay, Madras and Calcutta have been centres of administration for a long time. Population increased and with it commercial and industrial activities were inspired. Moreover, the railway systems were constructed from these ports during the latter half of the 19th century. Thus from political and railway centres they developed into great ports. With the increase in economic activities in the hinterland, the major ports will be called upon to bear greater and greater responsibility in sea-borne traffic.

Not only does the traffic tend to increase quantitatively but its pattern has been undergoing considerable changes, and these call for new techniques of handling. Provision has been made for berthing bigger vessels. The cargoes the ports are required to handle today, are much more complicated and are of varied nature. There is need therefore not only of expansion of port facilities but also of a thorough overhauling of the existing facilities, equipment, gear, etc.

The effectiveness of the existing capacity of the ports can be increased considerably "through modernisation and replacement of old and obsolete equipment." A very considerable portion of handling even in the bigger major ports in this country is still dependent on manual operation. There are places in certain major ports where cargo can be carried only on human head. The problem of modernisation of the ports in India is not therefore so much of installation of highly mechanised plants as of replacement of obsolete equipment and improvement of the general working condition.

The Principal Ports on the Western Coast of India

On the long coastline of Gujarat, there are in all 50 ports besides the port of Kandla. Only Kandla, Navlaki, Bedi, Sikka, Okha and Bhavnagar are open for traffic throughout the year, while remaining ports are closed during the four months of the monsoon. The total volume of traffic handled by all the ports in 1960 was 3·2 million tons of which Kandla's share was 1·1 million tons.

Bedi Bandar is a small port which does considerable coastal trade. The sea is shallow and, therefore, large steamers must anchor about 2 or 3 miles away from the shore. *Okha* occupies a very good position at the extreme north-east point of the Kathiawar Peninsula. Although the sea in this part is deep enough for large vessels, the circuitous approach to the port makes navigation rather dangerous and the scanty population and small railway mileage of the hinterland stand in the way of its development. The port is open at all seasons of the year and competes sometimes with Bombay by offering lower port charges. The imports are textile machinery, motor cars, sugar and chemicals. The exports are oil-seeds and cotton. The port authorities recently launched a campaign for attracting industrialists and businessmen of the area to import their requirements through the Bhavnagar port with a view to encouraging the development of ports in that area and to reduce import charge. The difference in mileage between Ahmedabad-Bombay and Ahmedabad-Bhavnagar is such that there will be a good economy in regard to railway freight charges if goods

are imported through Bhavnagar. Some of the other advantages to importers are: firstly, free days allowed in Bombay are five days whereas in Bhavnagar the importers are allowed fifteen days, and secondly, the delay owing to congestion at Bombay is obviated at Bhavnagar.

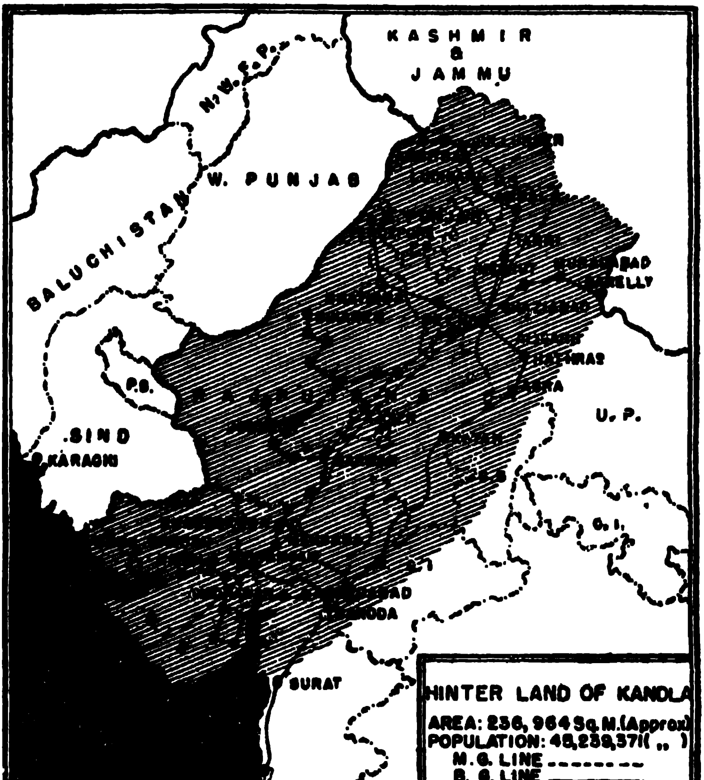


FIG. 69. In area, it is the third largest hinterland in the Union. Kandla provides an outlet for the larger hinterland covering Gujarat, Rajasthan, Punjab, Kashmir and Western U.P.

The urgency of a major port between Bombay and Karachi was felt as early as 1946 by the Ports Committee. Partition of the country made it still more necessary to provide an additional port to handle the traffic which was previously catered for by Karachi. The West Coast Major Port Development Committee recommended that a major port should be located at Kandla.

Kandla was built in 1930 as a small port to meet the requirements of the Cutch State only.

The Kandla creek, situated at the eastern end of the Gulf of Cutch, constitutes a natural sheltered harbour and is easily navigable. It has a depth of water of over 30 feet, suitable for ocean-going ships. Kandla has a bar across the entrance to the creek. The deep channel over the bar has a minimum depth of 13 feet and the minimum rise of the tide on any day of the year is 17 feet. There has been no deterioration in the navigational conditions at the mouth of the creek over a period of 20 years. The geographical position of the port is also best suited in its services to the hinterland covering Gujarat, Rajasthan, Punjab, Kashmir and Western U.P. As between Kandla and Bombay, Delhi is 656 miles from Kandla as against 860 miles from Bombay. Similarly Hissar is 688 miles from Kandla as against 733 miles from Bombay. Moreover potentialities for development of industries and mineral resources in the territory of Cutch are vast, in particular those of fish, cement, glass, gypsum, lignite and bauxite. In 1952, a metre gauge railway line was opened which now connects Kandla with the mainland. This line extends for 170 miles and meets the main railway line at Dessa. There are 15 major bridges along the route, the longest being the one over the Banas river about 2 miles from Dessa. A broad gauge rail link to Ahmedabad via Jhund is under construction. The construction of a national highway connecting Kandla with Ahmedabad is also in progress.

Work on the construction of the new major port of Kandla was taken up in 1949. Of all the problems confronting the development of the Kandla port town, the subject of water-supply is the main one. Cutch is an arid area, and the annual rainfall is little over 12 inches. There is however a substantial reservoir of underground water around Kandla—enough for the port and the town. There is also a surface water reservoir with a storage capacity of 448 million cubic feet which can be utilised in years of satisfactory rainfall. Among the facilities that are available at the Kandla port are (*a*) four deep-water cargo berths, (*b*) four ware-houses, (*c*) five mooring berths in the stream, (*d*) an oil berth to take large tankers, (*e*) a floating dry dock for small craft, and (*f*) a floating landing stage for passenger launches. The traffic through the port is more than 1·1 million

tons a year. The table below gives an indication of the fast progress of Kandla as a port.

TRAFFIC IN KANDLA

(in tons)

Year	Import	Export	Total
1955-56	... 205,390	102,512	307,902
1957-58	... 602,978	235,277	844,255
1959-60	... 828,047	295,469	1123,516
1960-61	... 1211,000	336,000	1547,000

The Third Plan has provision for the completion of two additional berths, expansion of township and schemes for increasing the water supply at the port of Kandla.

Bombay (seventy-five square miles in area) lies at the base of the Western Ghats. It has a natural harbour directly on the sea. The hinterland of Bombay extends from the western part of Madras in the south to Delhi in the north, and includes Western U.P., Rajasthan, M.P., and the Maharashtra State. It is now the first city from the point of view of population in the Indian Union and owes its importance to its magnificent harbour and its position as the nearest Indian port to Europe. It is connected with the interior by railways. It is the seat of the cotton textile industry. Although Bombay does not possess rich coalfields within 200 miles or a system of navigable rivers to bring produce down to the port, her volume of trade is always large in view of her natural harbour which is open at all times of the year. Bombay is the principal outlet for the staple products of Western India, in particular the raw cotton of the Deccan. Being the best natural harbour in India, the trade carried through Bombay is about 40 per cent of the total trade in India. Large quantities of oilseeds, wool and woollen goods, hides and skins, manganese ore and foodgrains are exported. The principal imports are manufactured cotton goods, machinery, railway plant, iron and steel goods, hardware, sugar, dyes, coal and petroleum. Bombay port handles about 10 million tons of imports and 4 million tons of exports. Limitations imposed by nature and the dock system stand in the way of the

expansion of Bombay port. The important schemes in the Third Plan include dock modernisation, dredging of the main harbour channel and deep draft berths.

Kozhikode (*Calicut*), 90 miles north of Cochin, is a port of periodical importance. During the early part of the monsoon, the port is practically closed to navigation. As the sea is shallow, steamers anchor about three miles off the shore. Coir, coir-fibre, copra, coffee, tea, ginger, groundnut and fish manure are the exports.

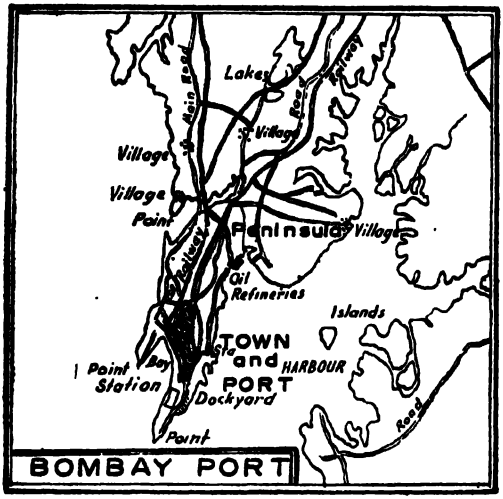


FIG. 70. Bombay is an inland port. It is connected with the mainland by railway bridges. The shape of Bombay Island is something like a lobster's claw, the pincers of the claw being Malabar point and Colaba point, and Back Bay the deep curve between.

Cochin, in Kerala, is the most important port between Bombay and Colombo. Its position is such that it can serve the whole of Southern India. Cochin became accessible to deep sea traffic only after 1929 when a channel of $3\frac{1}{2}$ miles long was constructed to remove the rock-hard sand barriers which blocked the approach to the harbour for centuries. In 1936, Cochin was declared a major port. It is open for deep water traffic in the worst monsoons and provides a splendid anchorage at all times of the year. The system of back-waters which are running parallel with the coast affords cheap transport and excellent waterways connecting several places of importance in Kerala. Cochin port serves the vast hinterland of Kerala and the southern districts of the three States of Madras, Mysore and Andhra. The port is also connected by air with Madras and Bombay with daily services. The plantation districts and the forest regions are also in contact by roads. The principal imports are foodgrains, oil, metals, chemicals and hardware. Coir, yarn, coir mats and mattings, copra,

cocoanut oil, tea and rubber are the chief exports from Cochin. It handles about 1·5 million tons of imports and 400,000 tons of exports.

THE PRINCIPAL PORTS ON THE EASTERN COAST OF INDIA

Tuticorin, an important port of the Madras State, is situated at the extreme south-eastern point of the Peninsula. The harbour is shallow, and constant dredging is necessary. Cotton, tea, senna leaves and cardamoms are the principal exports. The port has considerable trade with Ceylon. It handles 500,000 tons of cargo. The port will be in a position to have traffic of one million tons a year if a deep-sea harbour is developed to convert it into an all-weather port.

Madras, the third largest city in India, is the chief port of the State. Several railway lines connect it with Bombay, Tuticorin, Calicut and Calcutta. Although the port has considerable manufactures, it connot be compared with Calcutta or Bombay as a trade centre.

FIG. 71. Madras is an artificial harbour ill-suited to shipping during cyclones which occur in October and November.

Its extensive hinterland includes the whole of the Eastern Deccan, but then this area does not produce things which are required by foreign markets in large quantities. Moreover, many small seaports on the Coromondal and Malabar Coasts compete with Madras. Before the construction of the harbour, Madras was an open roadstead with a surf-beaten coast. It is an entirely artificial harbour, enclosing about 200 acres by quay walls extending 3,000 feet. Completed in 1859, it had an entrance from the east quay. This allowed waves into the

harbour practically throughout the year, which severely handicapped loading and unloading of cargoes. The harbour was, therefore, remodelled in 1911. The old entrance was closed, a new entrance opened in the north quay and a sheltering arm constructed. This measure was quite effective in reducing disturbance in the harbour in all weathers except severe storms.

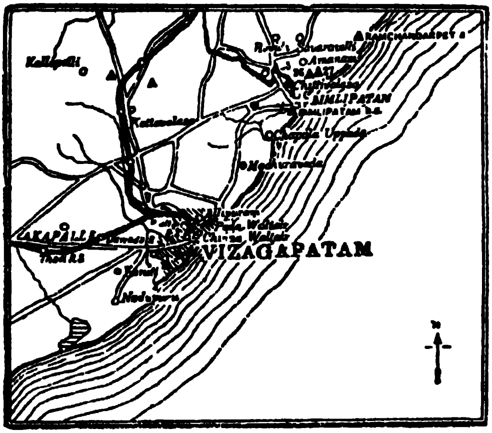


FIG. 72. Visakhapatnam port.

Generally in the months of October and November, cyclonic storms occur in the Bay of Bengal which generate waves as high as 11 feet. The deep sea waves become translatory as they approach the shore and cause a bodily movement of water. Such waves, at the entrance of the harbour, develop a slow periodic surging of water mass in the harbour. This is called 'range'. Such undulations of the water level produce a fore and aft motion of ships. Ships are, therefore, often instructed to leave port in such weather. The chief imports are coal and coke, foodgrains, mineral oils, metals, timber, textiles, machinery and chemicals. The exports are hides and skins, turmeric, tobacco and textiles. The port handles 2 million tons of imports and 800,000 tons of exports. There are projects for additional ore and coal yards and mechanical equipment for handling iron ore at the port.

Visakhapatnam : It has become a major port within very recent years. It is a port of call for all ocean-going and coastal traffic steamers. It is situated on the Coromondal Coast, about midway between Madras and Calcutta—500 miles south of Calcutta and 325 miles north of Madras. Manganese, groundnuts, myrobalans, hides and skins are the chief exports. Cotton piecegoods, iron, timber and machinery are the important imports.

For shipping the produce of Orissa and the eastern part of M. P., Visakhapatnam offers better facilities in respect of distance and charges than Calcutta. The harbour was created in order to supply an outlet for a large area of fertile country adjacent to the east coast of India with considerable mineral resources and no alternative access to the outside world. The harbour was opened in 1933. To a certain extent Calcutta was affected adversely by the opening of this port. Recently a shipbuilding yard has been opened here. The port is connected by the South-Eastern Railway with Bhilai and Raipur in Madhya Pradesh. The harbour at Visakhapatnam provides access for the vital crude oil supplies to the oil refinery. Thus the advantages of the port are the facilities of a fine harbour, for handling cargo, rail access by South-eastern Railway to provide distribubution inland, and development of major industries like ship building and oil refinery. The port handles more than 1·4 million tons of exports and 1·3 million tons of imports. The port has an additional capacity of 1·75 million tons.

Calcutta, the second largest city in India, is situated on the left bank of the Hooghly, nearly 80 miles from the Bay of Bengal. Although, primarily, it is a port for the Gangetic plain, it is also the greatest trading centre to the east of Suez. Its hinterland comprises Assam, West Bengal, Bihar, the Uttar Pradesh and parts of Punjab, Orissa and Madhya Pradesh, which are all connected with Calcutta by roads and railways. All these areas produce in large quantities goods which are wanted by foreign markets. The Ganga and the Brahmaputra by providing splendid natural waterways help to bring agricultural produce of the plains to be exchanged for the manufactured goods in Calcutta. As a matter of fact, the trade of Calcutta depends to a large extent upon waterway communications. It was estimated that, before 1947, about 25 per cent of the merchandise reaching Calcutta from the rest of India came by waterways and approximately one-third of this from Assam. As regards trade from Calcutta, about one-third was carried by water and of this nearly three-quarters went to Assam.

The port of Calcutta, which extends for about five miles along the banks of the Hooghly, suffers from the disadvantage of its river being silted up. The frequent formation of a tidal bore in the Hooghly is another difficulty. There are two im-

portant schemes to maintain and preserve Calcutta as a port—(*i*) the construction of an ancillary port at Haldia, 56 miles down stream of Calcutta for handling bulk cargo such as coal, iron ore, and food grains and also for lightening of general cargo vessels, and (*ii*) the construction of a barrage on the river Ganga at Farakka to improve the head water supply in the Hooghly. "Owing to lack of sufficient head water supply to flush the silt, there has been a steady and progressive deterioration in the regime of the Hooghly. Apart from its adverse effects on the navigability of the river, the gradual choking of the channel has led, on the one hand, to an increase in the frequency of the bore tides in the Hooghly, and, on the other, to a steady rise in the salinity of its waters." The construction of the barrage will not only provide a lasting solution but will also improve communications between North and South Bengal and reduce the length of inland water transport route between Assam and West Bengal.* The provision of greater facilities for incoming and outgoing ships is being provided. Calcutta handles about 30 per cent of India's sea-borne trade.

Calcutta with its suburbs is the greatest manufacturing area in India. Its jute mills, paper mills, cotton mills, sugar factories, engineering works, etc., use the coal of Raniganj and Jharia. Calcutta is the greatest jute centre of the world. Other industries of importance are rice mills, cotton mills, tanneries, perfumeries, iron and steel works and match-making. The principal exports are jute, tea, mica, coal, iron, manganese and

* There is no deep-water harbour in Calcutta and the vessels of more than 9,000 tons have to dock at Diamond Harbour, 40 miles down from Kidderpore. To increase the port facilities there was a proposal to connect the port of Calcutta with Diamond Harbour by a ship canal. This idea of a ship canal is not new, and, as a matter of fact, this proposal was examined seriously in 1945.

Apart from the question of heavy expenditure on the scheme, the main difficulty will be that many villages between Diamond Harbour and Kidderpore will have to be destroyed in the process of execution of the scheme entailing not only hardship on thousands of villagers but also loss of rice-fields.

Another problem is the Hooghly itself. If the canal is constructed, the Hooghly will not receive proper attention. It must not be forgotten that "the Hooghly provides the only outfall channel for the rivers of West Bengal and its abandonment will only aggravate the flood menace during the rains, but that the whole area would, as a consequence, get water-logged and unproductive." The Nadia rivers are also linked up with the Hooghly, both upstream and downstream of Calcutta. Therefore, the Hooghly should be revitalised by the infusion of fresh water from the Ganga, so that upstream and downstream navigability of the Hooghly may improve.

shellac. The principal imports are iron and steel goods, sugar, petroleum, motor cars, paper, chemicals, liquor, salt, rubber and machinery. The total tonnage of imports and exports which passed through the port during 1961 was 5·4 million tons and 4 million tons respectively. One of the heavy items of import is iron and steel.

Trade Centres

Trade centres have grown in six different classes of cities in India. These are: (*i*) holy cities, (*ii*) ancient capitals, (*iii*) ports, (*iv*) health resorts, (*v*) manufacturing cities, and (*vi*) modern administrative capitals.

India is a land of *holy cities*. Varanasi, Puri, Allahabad, Mathura, Madurai, Gaya and many other cities attract pilgrims as holy centres and, have now become important trade centres. Some of the *ancient capitals* of India like Nagpur, Poona, Murshidabad, Delhi, Agra, etc., are important as centres of trade. *Health resorts* are mostly confined to the sea-sides and the hills where people in large numbers go for a change from the plains. *Ports and manufacturing centres* in India command the largest trade because of railways and navigation facilities. The examples of new manufacturing cities are Durgápur, Bhilai, Rourkela, Jamshedpur, Bangalore, and Kotah (Rajasthan). The major sea ports of India are all centres of industries. Administrative reasons have also led to the development of many cities in districts and divisions of India: Chandigarh in Punjab, Calcutta, New Delhi, Bhopal, Cuttack, Hyderabad, etc.

Uttar Pradesh has an area of 113,409 sq. miles and a population of about 74 millions. It has made fairly good progress in agriculture, manufactures and road development. The principal crops are wheat, sugarcane, mustard, rice and pulses. Its position in respect of minerals is not at all satisfactory. A cement factory on the south bank of the river Sone in Mirzapur district is being run as a government concern. In the production of power alcohol, the State has made good progress. Two factories for the production of rayon yarn—one near Allahabad and the other in Dehra Dun are being established. The State contains at present 70 sugar factories, a few cotton mills and paper and glass factories. Handicrafts and village industries of

U.P. are well-known for their products like brocades and tissue at Varanasi, brasswares at Muradabad, wood works at Saharanpur, clay wares of Chunar and Lucknow, durries of Agra and Kanpur, and printed sarees of Furrukhabad. The important trade centres are Allahabad, Varanasi, Kanpur, Gorakhpur, Lucknow, Mirzapur, Moradabad, Aligarh, Agra, Dehra Dun, Jhansi, Mathura, Saharanpur and Bareilly.

Allahabad, 564 miles from Calcutta, is the principal railway centres of the U.P. It is situated at the confluence of the Ganga and the Jumna. There are several oil mills, glass factories and flour mills in the city. The trade is considerable, because the city enjoys unique advantages in regard to communication by rail, roads and rivers. *Varanasi* on the bank of the Ganga, is one of the biggest towns of India. The city being a place of pilgrimage to the Hindus, the pilgrim traffic is enormous. It is also an important industrial and commercial centre. Toys of wood, zarda, lac bangles, ivory articles, silk cloth, blanket sheets, linseed, mustard seed, sugar and gram are the chief articles of trade. There are several oil mills and silk factories. The place is also noted for brass-work. *Kanpur* is a great collecting and distributing centre for Northern India. It is also an important railway junction of the Northern and North-Eastern Railways. It has the largest manufacturing industries in the U.P. Cotton pressing and ginning are the foremost. Sugar mills, flour mills, iron foundries, chemical works, cotton mills and oil mills are the important industries. The population of the city is over 900,000. *Gorakhpur* is situated on the left bank of the river Rapti. The chief industry is carpentry. Timber is brought here from the Nepal border. The city has a large number of sugar factories. *Lucknow* is an important distributing centre for the rich agricultural produce of Oudh. The city is growing in importance rapidly. There are several railways and iron foundries. The articles of trade are silver and gold works, ivory and wood carving, pottery and perfumes. *Mirzapur,* an important industrial town in the U.P., is situated on a fertile tract of land on the bank of the Ganga. Carpets, rugs and silk cloths are the chief manufactures. Its stone business is also famous. *Moradabad,* the most important town of the district of Moradabad, is noted for brassware. *Agra,* on the Jumna, is an important centre of arts and manufactures. The articles of

trade are carpets, shoes, brass utensils, looking-glass frames and marbles. It is an important railway junction. It is also a collecting and distributing centre for Rajputana. *Aligarh* is famous for its manufacture of locks and other brassware. Bangles, glassware and butter are other articles of importance.

Punjab has an area of 47,456 sq. miles. Its population is a little above 20 millions. The availability of electric power from the Bhakra-Nangal units in addition to what the State was already receiving from the Uhl River units, has enabled Punjab to make remarkable progress in industry and agriculture. From the point of view of production of foodgrains, Punjab is second in wheat and gram, third in barley and maize and fourth in bajra. The number of factories has risen from 600 in 1947 to 3800 in 1961. There are more than 110,000 industrial workers in the factories.

	No. of factories	Industrial workers
1947 ...	... 600	37,486
1956 ...	... 2,350	62,000
1959 ...	... 3,500	102,000

The principal industries are cotton textiles (Amritsar, Ludhiana, Hissar), woollen textiles (Dhariwal, Panipat, Amritsar, Ludhiana), silk textiles (Ludhiana, Amritsar), paper (Jagadhri), sugar (Phagwara, Jagadhri, Rohtak), sports goods (Jullundur, Patiala), glass (Ambala), chemicals (Amritsar), cycles (Sonepat), cement, etc. The production of light engineering goods in small and medium-sized units is a recent feature, but the State has already established its reputation throughout the country for its products. The important trade centres are Amritsar, Ludhiana, Jullundur and Simla. *Amritsar* is famous for its carpets and shawls. The other important industries are the manufacture of textiles, acids, chemicals, hosiery and leather. *Ludhiana* and *Jullundur* are noted for light engineering products and hosiery.

Madhya Pradesh has an area of 171,200 sq. miles with 32 millions of people. It is one of the richest States of India in minerals. There are large deposits of coal, bauxite, iron,

copper, manganese, limestone, etc. The State is fairly industrialised and its industrial potential is quite high. The important industries are cotton textiles (Indore, Gwalior, Rajnandgaon, Ujjain, Dewas), potteries (Jabalpur), paper (Nepa mills at Chandi), cement (Banmore, Kymore), rayon (Gwalior), heavy electricals (Bhopal), iron and steel (Bhilai), straw board (Ratlam), etc. The important trade centres are Indore, Gwalior, Bhopal, Ujjain, Jabalpur, Dewas and Katni. *Jabalpur* is noted for cement, glass, lime and potteries. It has a gun-carriage factory. Its other industries are cotton textiles, brass and copper utensils, etc. *Katni* is an important centre for utensils, stones and grains.

West Bengal is a densely populated State. It has an area of 33,928 sq. miles and it contains a population of about 35 million. Though small, West Bengal is highly industrialised. The State produces about 5·5 million tons of foodgrains, whereas its consumption is about 6 million tons. The chief industries are iron and steel (Burnpur and Durgapur), jute (Hooghly basin with about 95 mills), cotton mills (Howrah, Srirampur, Calcutta), paper (Titagarh, Ranigunj, Naihati), chemicals (Calcutta), etc. About 1 million industrial workers are employed in the different industries of the State. The village industries of West Bengal provide employment to a large number of people. Silk and cotton goods are the important products of the village industries. West Bengal raises about 25 p.c. of the country's total coal production and 20 p.c. of tea.

The important trade centres are Calcutta, Howrah, Bhatpara, Asansol, Bally, Kharagpur and Burdwan. *Srirampur* and *Salkea* situated near Calcutta, possess a number of cotton mills. *Batanagar,* on the Hooghly, is a new industrial place, famous for shoe-making.

Though West Bengal is a small State from the point of view of area, it has 12 cities, in each of which the population is more than 1 million, thus accounting for more than 26 per cent of the total population of the State.

Maharashtra has an area of 118,495 square miles with about 40 million population. The State is drained by Tapti, Godavari, Bhima, Krishna, Wardha and Vainganga. The principal agricultural crops are rice, wheat, jowar, bajra, cotton, tobacco, groundnuts, sesamum, castor seed and sugarcane.

Minerals are considerable as will be evident from the following:

Iron ore	...	Ratnagiri, Kolaba, and Bhandara
Manganese	...	Bhandara, Vidarbha and Nagpur districts
Bauxite	...	Kolhapur, Ratnagiri, Singli and Thana
Coal	...	Nagpur district, Wardha valley
Limestone	...	Chanda and Yeotmal
Ilmenite	...	Ratnagiri
Silica	...	Ratnagiri
Chromite	...	Ratnagiri and Bhandara

The coastal region of Maharashtra has become a great industrial region of India. There are 97 cotton mills, 20 sugar factories, a number of engineering works, chemical factories, automobile industry, paper mills etc. The important industrial and trade centres are Bombay, Poona, Nagpur, Sholapur, Amravati, Akola and Nasik.

The State of **Gujarat**, formed in May 1960, has an area of 72,137 square miles with 20 million population. The State is bounded by the Arabian Sea on the West, Rajasthan on the North and East, Maharashtra in the South and Madhya Pradesh on the South-east. Because of the presence of several areas with low rainfall, the need or irrigation projects has been keenly felt. Between 1952 and 1957, a number of irrigation works have been developed. The principal crops are bajra, jowar, rice and wheat. The State has a food deficit of about 1 million tons a year.

Mineral deposits are considerable. Salt, limestone, manganese, gypsum, bauxite, petroleum and natural gas are being worked. The State raises about 25 per cent of the total salt production of the country.

The major industries are cotton and woollen textiles, electrical engineering, chemicals and cement.

The State has one major port (Kandla), six medium ports (Okha, Bedi Bandar, Bhavnagar, Verawal, Sikka and Porbandar), and about fifty minor ports. Gandhinagar, 15 miles from Ahmedabad city, is the new capital.

The industrial centres are Baroda, Surat, Ahmedabad, Bhavnagar, Jamnagar and Rajkot.

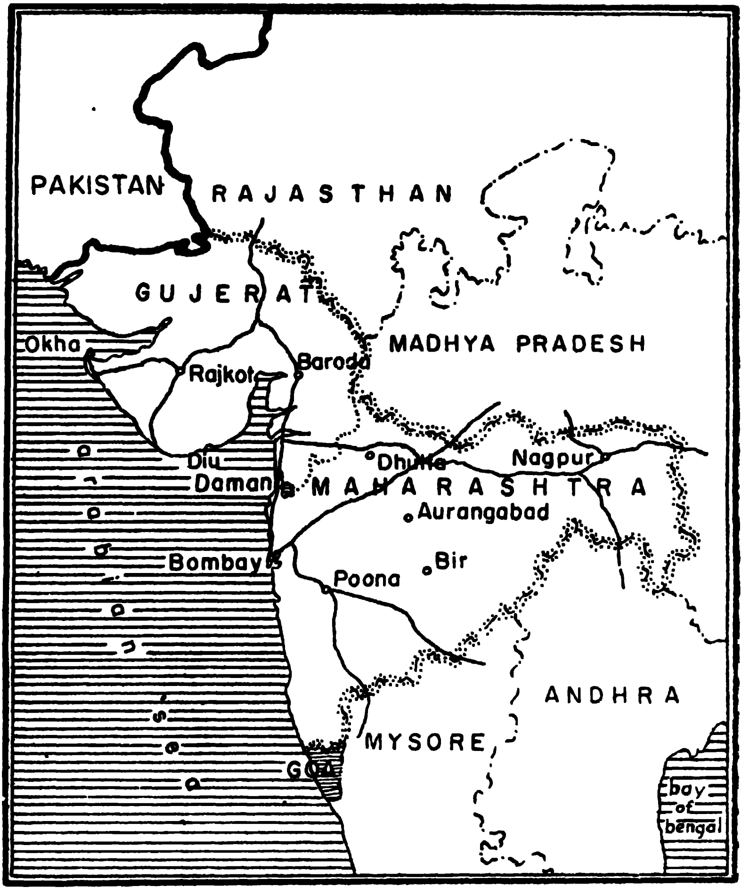


FIG. 73. Map of Gujarat and Maharashtra.

Madras has an area of 50,170 sq. miles with about 34 million population. The State is very rich in agricultural and forest products. Sandal wood, rose wood and teak are well-known throughout the country. The agricultural products are rice, sugar-cane, cotton, groundnuts, tea, coffee and millets. Minerals like lignite, bauxite, gypsum, iron ore and limestone exist in considerable quantities and are being steadily utilised. Madras has become a great industrial area within recent years. The

main industries are textiles, sugar, chemicals, cement, glass, tanneries and matches. The village industries whose products have demand in and outside the country give employment to more than 2 million people. The important trade centres are Madras, Madurai, Tiruchirapalli, Salem, Coimbatore, Tanjore and Tuticorin. *Madurai* has several weaving mills. Copper and brass vessels are also made here. In *Tiruchirapalli* there are many cigar factories. Coimbatore is the centre of cotton textile industry.

Delhi is the administrative centre of the Republic. It is also the greatest historical city in India. Like other old capitals in India, it has old court industries of gold and silver filigree work, muslin, wood and ivory carving and shawl-weaving. It is an important clearing house for Punjab and the western districts of the U.P. in cotton, silk and woollen piece-goods. It has several modern industries like chemicals, cotton spinning and weaving mills. Ivory carving, jewellery works, lace work and gold embroidery are the other important activities.

Delhi is magnificently served by roads, railways and airways. Since the national highways pass through Delhi, the road transport from Delhi to the Punjab, Rajasthan, U. P. and Madhya Pradesh is of vital importance. It has direct railway services with Bombay, Ahmedabad, Madras and Calcutta. It has two airports—one for inland services and the other mostly for transcontinental services. Since the river Jumna remains unnavigable for nine months in a year, the river traffic is of no importance. The growth of new industrial cities around Delhi like Gaziabad, Shahdra, Faridabad, Sonepat and Ballavgarh has added to the commercial activities of the city.

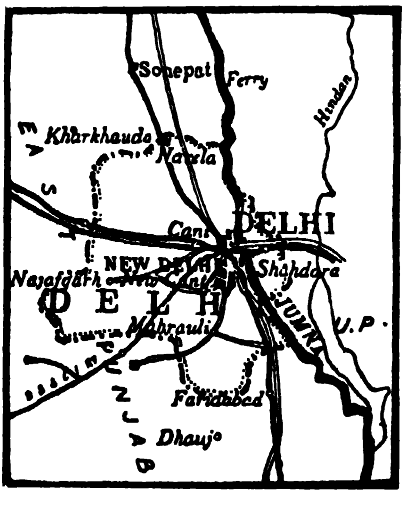


FIG. 74. Delhi.

Assam is the most easterly State of India. It is the only State in the Republic which has two international frontiers and as such, it has much strategic importance. Two-thirds of its area are inhabited by hill peoples who form one-third of its population. It has an area of 85,000 square miles with 11 million population. The State is rich in natural resources and holds out immense possibilities for many industries. Forests cover 40 per cent of the total area and have become very important for sustaining plywood industry. It has also large virgin tracts almost ready for cultivation. It is also known to be very rich in mineral wealth. As the only internal source of oil, Assam has an importance of its own for the country. The other minerals are limestone, glass sand, ilmenite, abrasives, white clays and coal. It has also vast hydro-electric resources. Agriculture is mainly confined to the Brahmaputra valley, and the principal products are rice and tea. The trade centres of the State are Shillong and Gauhati. *Shillong,* the capital of Assam, is in the Khasi Hills on an altitude of 4,000 ft. above sea-level. Fruits and hill-products are the articles of trade. *Gauhati,* on the left bank of the Brahmaputra, is the largest town and the most important port of Assam. It has a population of more than 100,000. Gauhati is a commercial centre and handles, as a port and a railway centre, silk, tea and timber.

Orissa has an area of 60,136 sq. miles with a population of more than 17·5 millions. Though rich in forest and mineral resources, the State is yet backward in industrial development. The frequency of floods from the Mahanadi has been controlled by the Hirakud Dam project which also supplies power to industry. More than 60 per cent of the iron ore production of the country is raised in Orissa. The other minerals are manganese, chromite, dolomite, coal and limestone. About 40 p.c. of the area is covered by forests which supply timber, bamboo, lac and various other minor products. Large-scale industries are being developed, such as steel plant at Rourkela, aluminium at Hirakud and paper mills at Chandwar. The principal trade centres are Cuttack, Puri, Berhampore and Balasore. *Cuttack,* the chief town of Orissa, has a population of more than 146,000. The local manufactures comprise lac bangles, shoes, toys and combs. It is connected by the Orissa Coast Canal with Chandbali. The city is 253 miles from Calcutta. Puri, a holy place

of the Hindus, is an open roadstead. As the sea is shallow, the steamers can anchor only about 7 miles away from the shore. The local manufactures consist of brass, silver and golden ornaments. Bhuwaneshwar is the capital of the State and is developing fast as a health resort and trade centre of importance.

Rajasthan has an area of 132,078 square miles and a population of about 21 millions. Though it is the third largest state in India from the point of view of area, the density of population is only 152 persons per square mile. Half the area of the State has desert conditions. The State is endowed with varied mineral resources, which when properly exploited will make Rajasthan an important mining region. The industries are concerned with the production of cloth, sugar, salt, cement, ivory goods, stone work, etc. The trade centres are Jaipur, Jodhpur, Udaipur, Bikanair, Alwar, Ajmere and Kotah. Jaipur is the capital of Rajasthan. The city has a population of more than 4 lakhs. It is famous for its artistic pottery and brass-wares. Jodhpur has a railway workshop and woollen and cotton mills. Stoneworks are also important.

Mysore with an area of 74,326 sq. miles and 23 million population is noted for coffee plantations, sandal wood, rose wood and gold. It has vast potentialities for industrial development. Sandal wood oil distillery is the biggest of its kind in the world and enjoys virtual monopoly in production. Other industries are iron and steel at Bhadravati, cement at Sahabad, aircraft manufacture and telephone manufactures at Bangalore, porcelain at Mysore, machine tools, etc. The trade centres are Bangalore, Mysore, Bellary, Hubli, Belgaum and Dharwar. Bangalore is 220 miles east of Madras. Carpets, cotton textiles, woollen goods, machine tools, aircraft manufactures, and telephone are the principal industries. In fact, Bangalore is the centre of industrial activities in Mysore. Soap, shellac, furniture and porcelain are also made. The population is more than a million.

Jammu and Kashmir has 92,780 sq. miles of area with about 6 million population. Over 85 per cent of the people depend on agriculture. The State is also rich in minerals though their exploitation is a difficult task because of inadequate means of transport. The chief sources of revenue are the village industry products and the tourists. The principal agricultural products

are rice, wheat, oilseeds and saffron. The fruits like walnuts, almonds, pears and apples are extensively raised and exported.

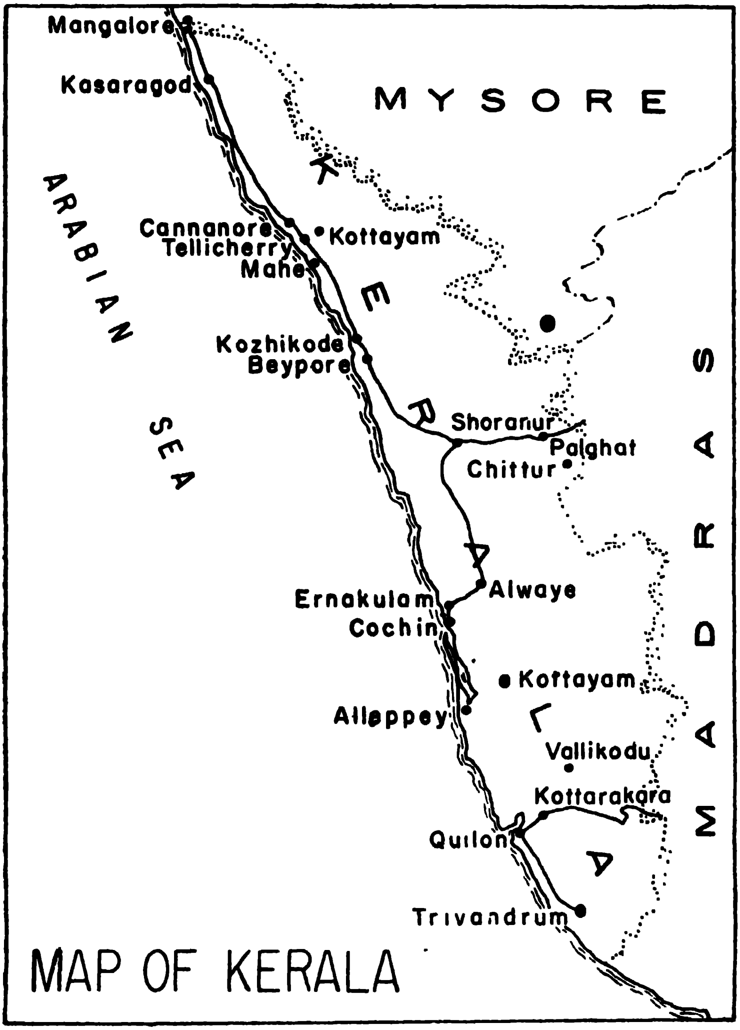


FIG. 75

The mineral resources have not yet been developed though coal, zinc, copper, lead, bauxite and asbestos are known to be in large deposits. Precious and semi-precious stones are commercially exploited. Woollen and silk manufactures of Kashmir are

well-known for their quality and design. The trade centres are Srinagar, Jammu and Udhampur. Srinagar, the capital of Kashmir, is famous for silk, embroideries and carved woodwork. The city has a population of over 2,80,000. Although Kashmir has no railway communication, excellent motor roads connect the different places with Srinagar and Jammu. Because of the natural scenic beauty, thousands of tourists visit Kashmir every year. Tourism thus provides one of the largest sources of revenue to the state.

Kerala with 15,035 sq. miles is the smallest State in India. It has about 17 million population, and the average density of population is 1125 per square mile. Kerala has a wide variety of minerals some of which are of great strategic value. Ilmenite, monazite, zircon, graphite, limestone, lignite and mica are the principal minerals. Fishing and agriculture are the chief industries, but in recent years, the State has made good progress in manufacturing industries like ceramic, rubber, rayon, chemicals, glass, aluminium, plywood etc. Most of the modern large scale industries of Kerala are either Government owned or sponsored. The trade centres are Trivandrum, Cochin, Quilon, Alleppy, Ernakulam and Trichur. *Trivandrum* is an important industrial, commercial and educational centre. It is noted for coir fabrics. pencils, ivory works, cement and nuts.

QUESTIONS

1. The growth of Kanpur as an industrial centre in recent years has been phenomenal. State the causes. (Cal. Inter. 1946).

2. What are the major and minor ports in India? Give some examples of each. What steps are being taken for the development of ports in India? (Raj. B.Com. 1957).

3. What is meant by "coastal shipping? Name the ports of importance in India's coastal trade and state the position of Indian shipping companies in the coastal trade of the country. (Cal. B.Com. 1948).

4. Discuss the commercial importance of *any five* of the following:— Kanpur, Visakhapatnam, Nagpur, Jharia, Jabalpur, Dibrugarh, Bangalore and Amritsar. (Rajasthan B.Com. 1959).

5. Discuss the importance of the following (*a*) Agra, (*b*) Calcutta, (*c*) Ludhiana, (*d*) Kanpur, (*e*) Digboi, (*f*) Ahmedabad, and (*g*) Kandla. (India Institute of Bankers 1962).

6. What is a hinterland? Give an idea of the hinterlands of Calcutta and Bombay.

7. Analyse the geographical conditions that have contributed to the location and development of Calcutta as a port. What are the navigational difficulties facing this port, and what do you suggest for their remedies?

(Cal. B.Com. 1961).

8. Draw a map of India and indicate the major sea ports with their hinterlands. Discuss briefly the trade that passes through each of them.

(Rajasthan B.Com. 1957).

9. Discuss the important factors in the origin and development of sea ports. Give examples from India.

(Delhi B.Com. 1963)

CHAPTER XVI

THE REPUBLIC OF PAKISTAN

Pakistan, until 14th August, 1947, a portion of India, was constituted as a dominion because of the demand of the majority of the Muslims of India for a separate State* In March 1956, Pakistan was proclaimed as an Islamic republic.

AREA, SIZE AND POPULATION

Pakistan is a federation of two units—West Pakistan and East Pakistan. The total area of Pakistan is 364,734 square miles. The former provinces of West Punjab, Sind, North-West Frontier Provinces, and Baluchistan have been integrated as a new province of West Pakistan, while East Pakistan comprising the eastern territories of the partitioned province of Bengal and the former Sylhet district of Assam is the other province. The area and population of the two units are as follows:

Unit	Area in sq. miles	Population (1951)
East Pakistan ...	54,501	42,062
West Pakistan ...	310,226	33,780
	364,727	75,842

According to 1961 census, the population of Pakistan has increased to 93·8 million.

The two disproportionate units are separated from one another by about 1,500 miles. East Pakistan is almost an *island* in the Indian Republic.

The area of the country is a little less than that of Burma and is roughly equivalent to that of the United Kingdom and France combined.

* It is a new state in an old land in as much as the Indus Valley had a well-developed civilisation in 2500 B.C.

West Pakistan which stretches from latitudes 24° to 37°N borders Iran, Afghanistan, India and the Arabian Sea. The province of West Pakistan is divided into 10 divisions, each of which has been subdivided into a number of districts.

Divisions	Area (in sq. miles)	Population ('000)	Population per square mile
Peshawar	27,536	5,088	184
Dera Ismail Khan	21,261	2,085	98
Rawalpindi	11,855	3,879	327
Lahore	9,119	5,340	586
Multan	16,761	6,953	415
Bahawalpur	32,443	3,205	98
Khairpur	20,449	2,586	126
Hyderabad	35,998	2,342	65
Quetta	35,027	585	14
Kalat	98,975	589	6

East Pakistan is situated between latitudes 20°45′ and 26°30′N with frontiers along India on three sides. It has a border with Burma for 170 miles and the Bay of Bengal for about 450 miles. East Pakistan consists of three divisions of Dacca, Chittagong and Rajshahi. The divisions and the districts under each, are as follows:

Dacca Division ...	Dacca, Mymensingh, Faridpur and Bakarganj.
Chittagong Division	Chittagong, Tipperah, Noakhali, Chittagong Hill Tracts and Sylhet.
Rajshahi Division .	Rajshahi, Dinajpur, Rangpur, Bogra, Pabna, Kushtia, Jessore and Khulna.

Pakistan has a long coastline with a variety of interesting features. The Bay of Bengal is indented by a series of shallow channels and bays while along the Arabian Sea side, the coastline is relatively smooth.

The estimated population of Pakistan is 93 millions, and of these some 86 per cent. are Muslims. The average density of population is 200 per square mile, but its distribution is very uneven as more than 792 people per square mile live in East Pakistan while it is 6 in Kalat division. Tipperah district in East Pakistan is the most populated area in the whole of Pakistan. Next comes Dacca. The density figures are 1,500 per square mile in Tipperah and 1,492 in Dacca districts.

It is interesting to note that the highest density of population in West Pakistan is 586 persons per square mile. Lahore and Multan districts head the list with 586 and 415 persons per square miles respectively.

Pakistan is now the fifth largest country in the world in point of population, being preceded by China, the Indian Union, U.S.S.R. and U.S.A.

About 90 per cent of the population live in villages as against 86 per cent in the case of the Indian Union.

In Pakistan, the State languages are Bengali for the whole of East Pakistan and Urdu in West Pakistan. Other regional languages are Sindhi and Pushtu.

NATURAL REGIONS AND CLIMATE

West Pakistan and East Pakistan have quite different climatic conditions. The climate of West Pakistan is dry and subject to extremes of temperature—winter being from below freezing to 75°F and summer from 90° to 120°F. West Pakistan lies outside the tropics, and its climate has continental characteristics. Summer is the season of intense heat, violent dust laden winds, low humidity and great aridity. Winter, however, is a season of considerable cold, large diurnal range of temperature, little rain, and comparative calm with low humidity.* Rainfall in West Pakistan is very unevenly distributed with 7″ in the north, 10″—15″ in the central part and 0″—3″ in the south. The climate of East Pakistan is sub-tropical with high rainfall, high temperature and high humidity for two-thirds of the year (March to October).

* See Economy of Pakistan by J. R. Andrus and A. F. Mohammed (Oxford University Press, 1958), p. 12-13.

From a geographical aspect, Pakistan may be divided into six regions.

West Pakistan ... (1) Dry Plateau.
(2) North Western Dry Hill Regions.
(3) Arid Plains.
(4) Deserts.

East Pakistan ... (5) Wet Lowlands or New Delta Region.
(6) Ganges-Brahmaputra Doab.

(1) The whole of Kalat division in the south-west of West Pakistan is a dry plateau and lies outside the influence of the

FIG. 76. The entire mountain system is composed of young and soft sedimentary rock and covers about 180,000 square miles of area.

monsoon and geographically belongs to the Iranian plateau. The cimate is subject to extreme heat and cold with rainfall uncertain and scanty. "Owing to its elevation, the dryness of the air and the direction of the mountain ranges, Baluchistan

has very severe winter." Due to lack of water, only a small fraction of the country is under cultivation by means of "Karez" irrigation or by flood waters from the rivers. The principal crops are millets, wheat and fodder. There is very little surplus and whatever there may be cannot easily be exported on account of the difficulties of transport. Fruits are extensively grown. Grapes, apricots, peaches, apples, pears and melons are exported. Mulberry cultivation is also practised.

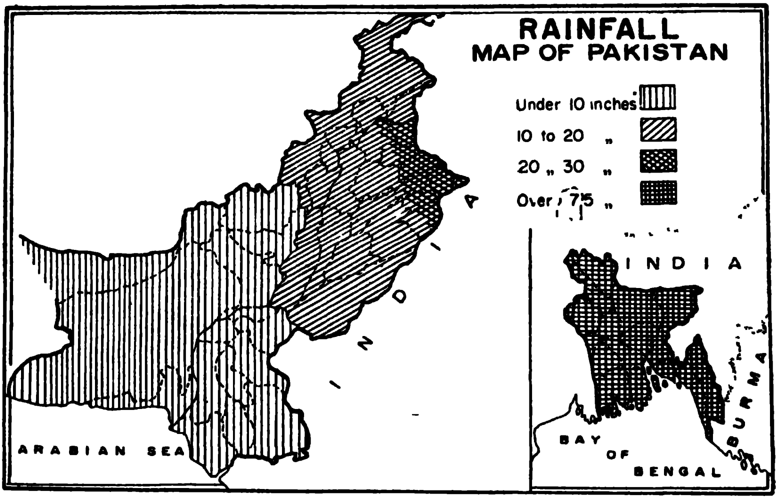


FIG. 77.

(2) The Peshawar division and the adjoining areas of the Western Pakistan belong to the Dry Hill Regions. The whole region is a mass of mountains pierced by several passes which function as trade routes to neighbouring countries. The rainfall nowhere exceeds 20 inches. The rivers are the keys to the geography of the region. The roads follow the valleys of the rivers. Irrigation has been developed in the valley of Peshawar and the Bannu plain where the population is the thickest. The region is outside the influence of the monsoon and most of the scanty rain falls in the cold season. The soil and climate are generally unsuited to the growth of large trees, but adapted to scrub jungle of a drought-resisting type. The important crops are wheat, gram and millets. The region is noted for the production of fruits like grapes, melons, pears, figs,

peaches and pomegranates. These are exported in large quantities to India.

(3) The plain encompasses the valleys of the Indus and its tributaries and covers the whole north-eastern and south-western and the southern portions of West Pakistan. The plain is drained by the five rivers Jhelum, Chenub, Sutlej, Ravi and Bias—all of which join the Indus. The rivers are perennial and give rise to floods in the monsoon season. The north-eastern plain is damper and grows crops without irrigation. The rainfall is between 10/12 inches. The western plain is very dry and all crops are dependent on irrigation.

The southern portion is a dry alluvial plain stretching from the edge of the Baluchistan plateau to the Thar desert on the east. Agriculture is developed with irrigation along the Indus Basin. The rainfall is less than 10 inches.

(4) The desert covers the south of the Sutlej and the eastern portion of Hyderabad division. The region is, really speaking, the Western part of the *Thar* desert. The rainfall is less than 5″ a year.

(5) East Pakistan is a new deltaic region formed by the Brahmaputra and the Ganges. Every year huge quantities of silt are brought down by the rivers. During the monsoon period, a great part of the region is flooded, and a rich deposit of silt is spread over the country. This reason is a land of rivers, and there are few roads. The rivers thread their way across the region and eventually flow towards the Bay of Bengal. In their lower reaches, the Brahmaputra and the Ganges are called the Jumna and the Padma respectively.

The rainfall is more than 75 inches everywhere, and soil is very fertile. Rice, sugar-cane and jute are the principal crops. The climate of East Pakistan is sub-tropical with a high humidity. East Pakistan also produces sub-tropical fruits like mangoes, pine-apples, jack-fruits and bananas in abundance.

(6) The northern part of East Pakistan is really a portion of the Ganges-Brahmaputra Doab. The surface is usually flat, broken here and there by low hills.

The east and the north-east of East Pakistan consist of hills and mountains of which the Lushai Hills in the east stretch as far south as Chittagong. The most important crop is tea which is grown along the slopes of the hills.

The climate of East Pakistan is typically monsoon with the temperature uniformly mild both in winter and summer. The average annual rainfall in East Pakistan is 75 inches.

Irrigation

Pakistan with a little more than 27 million acres of irrigated land occupies the second position in the world in respect of canal irrigation. The importance of irrigation in the case of West Pakistan can hardly be exaggerated. In West Pakistan, the rainfall is not only uncertain but also varies from year to year. The rainfall is under 10 inches in the whole of Kalat and Hyderabad divisions, while it is between 10 and 20 inches in West Multan division and the north-western part of Rawalpindi. Only the extreme eastern part of West Punjab receives more than 20 inches rainfall.

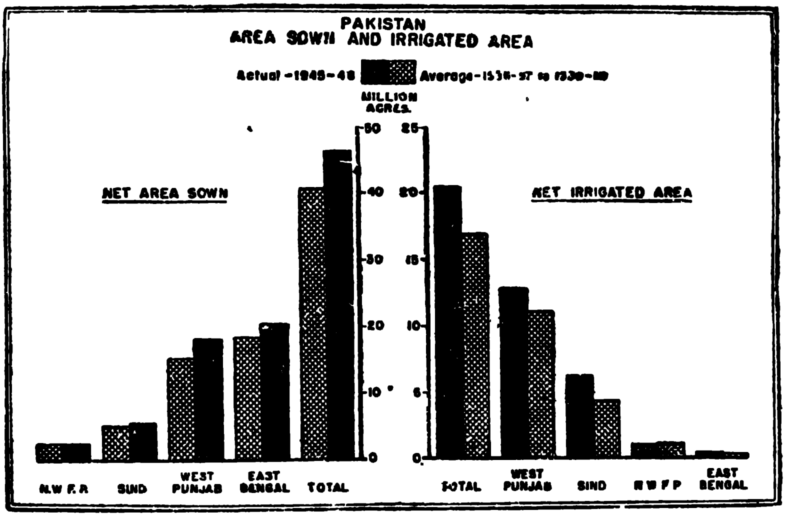


FIG. 78. East Pakistan with largest area under cultivation has least development of irrigation. West Pakistan leads in regard to irrigation which has converted deserts into flourishing lands.

"One year in five may be expected to be a dry year, and one in ten a year of severe drought." West Pakistan, therefore, depends to a great extent, for cultivation on the irrigation works. About 34 per cent of the cultivated area of Pakistan is irrigated compared to 18 per cent in the Indian Union.

Much of the irrigation in West Pakistan is by canals which get water from the Indus and its tributaries. The canals are of two types: (*a*) inundation canals and (*b*) perennial canals. The inundation canals get water when the rivers rise as in the summer, while the perennial canals are sure of water supply throughout the year as dams and weirs are built in different points of the rivers to raise the flow. While irrigation has greatly helped the development of agriculture, one serious problem has also been created along with it in the West Pakistan. 20,000 to 40,000 acres of land are going out of cultivation every year because of water-logging caused by seepage from the beds of unlined canals. Water-logging is accompanied by an accumulation of deleterious salts which make cultivation impossible.

The canals of the Punjab are of importance for two main purposes: one is to have water for irrigation and the other for carrying water from one river to another to serve as a feeder or link so that deficiencies in one river can be made good from the surplus of the other.

The eastern part of West Pakistan including the districts of Multan, Montgomery, Lyallpur, Lahore and Shahpur constitutes a canal colony, where the conditions are excellent for developing irrigation.* The Indus and its tributaries spread out over the province like the fingers of an open hand. With the exception of the North-West, these areas are flat with soft alluvial soil and thus permit canals to be dug cheaply. The development of canal irrigation has transformed the Lyallpur and Montgomery districts which were more or less like semi-deserts, into fertile agricultural lands. About 17 million acres of land are irrigated by canals in the eastern part of West Pakistan (formerly West Punjab). The total discharge of water into all these canals is approximately 285,000 gallons per second. The total length of all the irrigation channels is 54,300 miles.

(*a*) The largest irrigation work is the Lower Chenub Canal which was first constructed in 1890. It has 2,437 miles of channels and irrigates more than 2 million acres of land of the Lyallpur colony. It takes its water from the Chenub at Khamki and has turned a semi-desert tract into a rich agricultural area

* More than 50 per cent of the irrigated area of the West Punjab is confined to Lyallpur, Shahpur, and Montgomery.

around Lyallpur, where population has increased with great rapidity after the opening of the canal system. Before its construction, the density of population in this area was very sparse and never exceeded 10 people per square mile. At present there are more than 300 people per square mile. In winter months, the Chenub is dry below Khamki. The percolation of water, however, into the Chenub below the head-water is considerable and there is appreciable supply of water at the junction of the Chenub and the Jhelum.

(*b*) The Lower Jhelum Canal has 583 miles of channels and irrigates more than 8,60,000 acres of land of the Chaj Doab (lands between the Jhelum and the Chenub). The head-stream is at Rasul on the border of Kashmir State. In winter months the Jhelum is almost dry below Rasul.

(*c*) The Upper Jhelum Canal takes its water from the Jhelum at Mangla in Kashmir and irrigates Gujarat lying between the Upper Jhelum and the Upper Chenub. The canal was opened in 1915.

(*d*) The Upper Chenub Canal takes its water from the Chenub at Marala in Kashmir and joins the Lower Bari Doab Canal at Balloki on the Ravi. The canal was opened in 1912. The canal serves Sialkot, Gujranwalla and Sheikhpura.

(*e*) The Upper Bari Doab Canal which has its headwater at Madhopur and passes through Amritsar district in the Indian Union, also irrigates Lahore and Montgomery districts. This canal was one of the oldest and most important in the undivided Punjab.

The Lower Bari-Doab Canal does not possess sufficient water, because the Upper Bari-Doab Canal in East Punjab takes away much water from the Ravi at Madhopur. The Upper Chenub Canal has, therefore, been connected with the Lower Bari-Doab Canal at Balloki. Again, owing to the existence of the Upper Chenub Canal, the Lower Chenub Canal does not possess sufficient water. By a bold engineering conception, the Upper Jhelum was connected with the Lower Chenub at Khamki. The entire project was completed in 1933. The total area irrigated by the triple project is about 4 million acres.

In Bahawalpur there are three canals, namely, the Bahawal Canal, the Fordwan Canal and Sadiquia Canal—all taking off from the Sutlej. In Bahawalpur division an irrigation scheme is

being implemented which will bring 260,000 acres of land under cultivation very soon.

Hyderabad division (formerly, Sind) is beyond the influence of the south-west and north-east monsoons, and in consequence

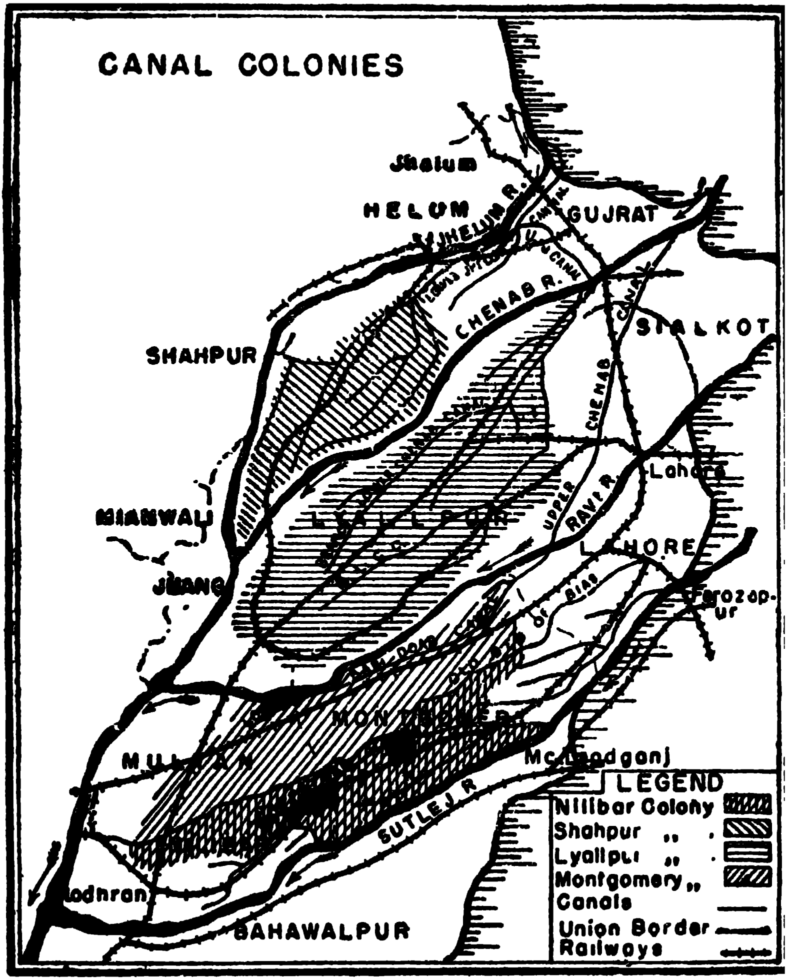


FIG. 79. The amount of water available varies from canal to canal and is limited by the water supplies of the rivers from which the canals off-take. The water of the Jhelum river can be switched into the Chenub *via* Upper Jhelum feeder and the water of the Chenub can be switched into Ravi *via* the Upper Chenub feeder. The Lower Bari Doab Canal, although taking out of the Ravi, is entirely dependent on the Chenub for its supplies. It may be mentioned in this connection that the head-waters of the U.J.C., U.C.C., U.B.D.C., and the Sutlej system are in the Indian Union.

its rainfall is below 10 in. In normal years, nine-tenths of the area cultivated depend on irrigation by canals. The Indus is the only source of water to the canals of Sind. Since the upstream tributaries are utilised for irrigation canals before they join the main river, the flow of water in the Indus is naturally affected. Partly to remove the threat of its inundation canals being rendered inoperative, and partly to provide a sufficient flow in the lower Indus to permit navigation, the Lloyd Barrage was constructed at Sukkur. The Lloyd Barrage Scheme opened in 1932 is one of the marvels of engineering science. A great dam has been constructed across the Indus river by putting a barrage at Sukkur in order to control the waters of the river; from the dam, water is distributed by means of seven large canals to different areas of Sind. The two largest canals are the Eastern Nara (226 miles) and the Rohri (208 miles). The Sukkur Barrage has transformed Hyderabad Division from a desert into a granary of Asia and irrigates about 5·5 million acres of land. The Upper Hyderabad area which is not served by the Lloyd Barrage System has three canal works—(*a*) the Desert Canal, (*b*) the Begari Canal and (*c*) the Unhar Wah Canal. The Lower Sind area has two canals—(*a*) Karachi Canal and (*b*) Fuleli Canal. In 1958, another canal was constructed to take off water from the Ghulam Muhammad barrage across the Indus which will irrigate 2·3 million acres of land in the Lower Sind area. In the northern part of Sind, a barrage is being constructed on the Indus at Gudu, 90 miles above Sukkur to ensure adequate supplies of water to inundation canals and to convert them into perennial canals. Thus, the three barrages will serve the Northern, Central and Southern regions of Sind for agriculture.

In Peshawar division about 400,000 acres of land are now being irrigated by canals which take off from the Swat and the Kabul. There are four major canals: the lower Swat, the major Swat, the Kabul river canal and the Paharpur canal. The upper Swat system was opened in 1914 and now serves about 70 per cent of the irrigated area of the province.

There is a great scope for further development of canal irrigation in West Pakistan. All these projects will make available a further twelve million acres of land for cultivation. Because of the importance of the development of water resources for irrigation, flood regulation and drainage as a way of increas-

ing the agricultural yield and expanding the cultivable area, the Government has undertaken many schemes.

The important projects are the Thal Project, the Rosul Project and the Warsak Project. The Thal Project is to draw water from the Indus to irrigate the three districts of Shahpur, Mianwali and Muzaffargarh which are located between the Indus and the Thal desert. The project will supply water to a million acres including 0·7 million acres of new land. The Rosul Tubewell Project envisages the construction of 1,800 tube-wells to provide sub-soil water and to reclaim water-logged areas by pumping sub-soil water back to canals.

The Warsak Multipurpose Project of the Peshawar division will develop 100,000 Kw. of energy and provide facilities for irrigation to 60,000 acres of land in the Peshawar district and several thousand acres in the Tribal areas, including a portion of the Bhajuri plain, outside Jamrud. The project will enable the Kohat Valley to construct tube-wells for irrigation. The Warsak will supply power for working the Mullagori marble mines, four miles from Warsak dam, coal deposits in the Cheral hills near Peshawar and in the Kohat district, gypsum in Kohat, copper ore in the Mohmad country and subsidiary industries. It will also provide canal navigation.

Mention may be made here of the Indus Waters Settlement of 1960 between Pakistan and India. Most of the head streams as well as the sources of the West Pakistan canals are in Kashmir and East Punjab. The settlement provided for division of the water supplies from the Indus and its five tributaries between India and Pakistan. A fund totalling about £380 million is being raised to pay for the necessary engineering works in Pakistan which will redistribute the water supplies.

Wells are being introduced for irrigation in West Pakistan. Small power-pumps are used in well-irrigation, particularly in the districts of Lyallpur, Jhang, Sheikhpura and Sargodha. "Karez" is an underground system of irrigation which is extensively practised in Baluchistan plateau. Here the soil is open and porous and is composed of waterworn stones; but below the surface the soil is hard, impermeable and conglomerated. Therefore, water is found flowing in many places below 20 or 30 feet from the surface, although on the surface itself there is no water. The water thus found is led gradually towards the

surface through the Karez. A series of wells are dug at intervals of 15 to 25 yards, and connected below by an underground passage, through which the water runs till at last it reaches the surface and is utilised for irrigating the fields. "Where perennial supplies are available, favourable soil conditions permit the growing of fruits, nuts and vegetables. Where water supply is less dependable, food grains may be grown, though the incidence of failure is great and yields low."

The problem of irrigation in *East Pakistan* is that of too much water. Floods are an annual feature, and about 33 per cent of land are affected by them "The lack of adequate drainage is painfully apparent in flood time". Since cultivation is, in the main, rain-fed, modern methods of irrigation are almost absent. Recently, however, a few multipurpose projects are being developed for reclamation, drainage, irrigation, navigation and generation of power. The following irrigation projects are under construction:

(*a*) The Ganges-Kobadak Project which will irrigate 1·8 million acres in the districts of Khulna, Jessore and Kushtia. "The project involves the pumping of silt-laden Ganges water into canals for irrigation, while the decadent Kobadak river is to be improved as a trunk drain, to be fed by a system of drainage channels, thereby, controlling the amount and timing of water remaining in the land and reducing the effects of floods".

(*b*) The Teesta Barrage to irrigate 1 million acres of land by a dam across the river Teesta.

(*c*) The Karnaphuli project to reduce floods in the Chittagong region, to improve navigation and for drainage.

Agriculture

Agriculture is the most important industry in Pakistan, as more than nine-tenths of the population depend on it for their living. West and East Pakistan have different climates in consequence of which the crops, too, are different in two regions. Then again, the main problem of West Pakistan is to maintain adequate supplies of water, while in the case of East Pakistan,

it is the control of floods. East Pakistan depends on the rainfall for its agriculture, but in West Pakistan, irrigation farming is the characteristic. Agriculturally, six zones can be distinguished in Pakistan: (*a*) Sub-Montane—the Peshawar division, (*b*) North-eastern plains of canal colonies, Gujarat and Sialkot, (*c*) North-West—Rawalpindi, Jhelum, Attock, Mianwali, Peshawar, Kohat and Bannu, (*d*) South-Western plains—Gujranwalla, Lahore, Lyallpur, Montgomery, Multan, Bahawalpur, Dera-Ghazi Khan and Dera Ismail Khan, (*e*) Hyderabad, (*f*) East Pakistan. Out of 123 million acres of land in Pakistan, about 56 million acres are at present cultivated, the remaining acres being uncultivated.

The principal crops are wheat, rice, maize, sugar-cane, tea, jute, cotton, oil-seeds and tobacco. "Pakistan is an agricultural surplus area which can feed its own people, export some wheat and a great deal of cotton and jute."

LAND UTILISATION IN PAKISTAN

(in 1000 acres)

Year: 1949-50 to 1953-54	Forests	Uncultivable waste	Cultivable waste	Net area sown
West Pakistan	3,211	52,370	22,743	29,072
East Pakistan	2,927	5,010	4,307	20,096
All Pakistan	6,138	57,380	27,050	49,168

Malarial conditions, lack of drainage, lack of water, deep rooted grasses and weeds, erosion and other natural factors are responsible for the existence of cultivable waste land.

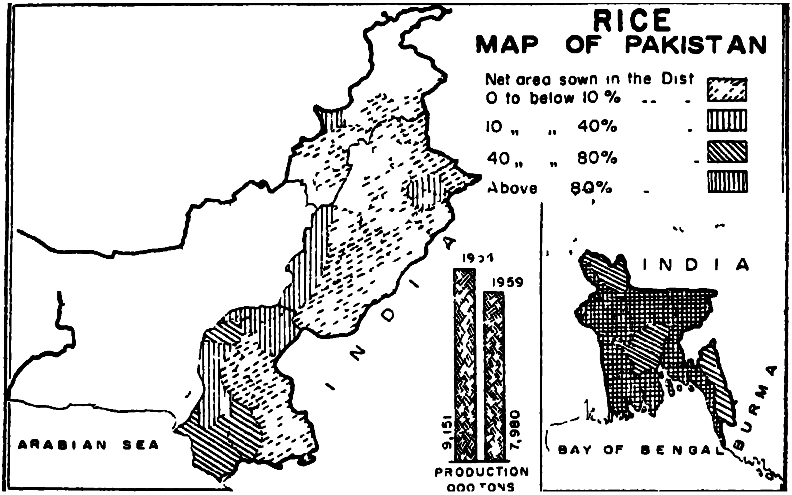
The great mass of the population are engaged in agriculture. Consequently, marginal lands with low potential for production have been brought under cultivation. The continuous sub-division and fragmentation of holdings, and old-fashioned agricultural practices coupled with the fact that the peasantry is not yet very literate have kept the yields per acre very low. Of late, there has been a very high rate of outward movement from land. "The movement into non-agricultural occupations has been stronger in West Pakistan, where only

54 p.c. of the active population is now in agriculture, than in East Pakistan, where the proportion is still three-quarters of the total." Mechanised cultivation has already begun in certain areas of canal colonies. In Baluchistan plateau mechanised cultivation is concentrated on fruit cultivation. Mechanisation of agriculture is not necessary in the lower Indus valley as the lower and upper Sind barrage has helped to increase cultivation in the province. The Chengri Valley of the Chittagong Hill Tracts is being developed for mechanised cultivation. At present the delta region of East Pakistan is full of diseases and lying almost uncultivated. This region is being brought under cultivation with the help of modern farming methods and through the efforts of the World Health Organisation and the Food and Agricultural Organisation. The problem of flood is also serious in East Pakistan. In the Rangpur district, crops suffer on account of floods in the Jamuna. The National Flood Commission has undertaken the work extending the existing embankment in the area. As the crop yield per unit is much lower as compared to the other progressive countries of the world, an increasing amount of fertilizers has been in demand for agricultural improvement. Two fertilizer factories have been set up, one each at Daudkhel and Lyallpur to meet the demand for fertilizers. Soil conservation, locust control, farm mechanisation and plant protection from pests and disease are the other steps for agricultural progress.

Food crops occupy about 85 per cent of the total cultivated area of Pakistan. About half of this area is in East Pakistan. The production of foodgrains in Pakistan is always uncertain. "Since West Pakistan is largely desert, with little rainfall, and East Pakistan is largely delta, with too much rain and water in the wet season, the country is apt to suffer from natural disasters which can easily upset the balance between food production and consumption." When in any year nature is favourable, Pakistan gets good crops and can export too. When there is a crop failure on account of floods, or droughts, the country finds it difficult to maintain consumption and to earn foreign exchange by export. The Second Five Year Plan of Pakistan which has been initiated in July 1960 aims at increasing foodgrains by over 20 per cent to make the country self-sufficient by the end of the Plan period.

The total area under foodgrains in Pakistan is normally

about 38 million acres with a production of about 17 million tons. Of this, about 23 million acres are under rice with a production of nearly 12 million tons and 10 million acres under wheat with an aggregate output of 3 million tons. The remain-



· Fig. 80.

ing acreage is under maize, millets and barley Conditions in agriculture have not improved in the last ten years. Between 1948 and 1957, there has been an increase by 4 per cent only. The total volume of cereal production has remained more or less the same. Consequently, Pakistan is increasingly dependent on food imports though, in a good year, she can have a surplus.

YIELD AND AREA UNDER FOOD CROPS

	Area ('000 acres)	Production 1954 ('000 tons)	1959 ('000 tons)
Rice	22,494	9,151	7,980
Wheat	12,159	3,683	3,865
Jowar	1,106	221	215
Bajra	1,971	359	305
Maize	1,140	437	466
Barley	519	156	139
Gram	3,122	645	600
Edible oil seeds	1,957	272	382

Rice: From the point of view of area and yield, rice is the most important crop of Pakistan. It is the staple food for the people of East Pakistan. About 23 million acres of land are under rice, of which East Bengal alone possesses 20 million acres. East Pakistan has an ideal climate and soil for rice cultivation. In every district of East Pakistan rice accounts for more than 60 per cent of the sown area. The output of rice varies considerably from year to year because of uncertainties of rainfall. In East Pakistan, rice is harvested three times a year—the autumn rice in August and September, winter rice in December and January. and summer rice in March and April. The three crops of rice are not generally raised in the same land as rotation is practised with jute. The highest yield per acre comes from the summer crop. The largest acreage, however, is covered by winter rice.

Pakistan raises about 12 million tons of rice annually to which East Pakistan contributes 10 million tons. Normally East Pakistan is a deficit area in rice by about 1 million tons and the deficit is met by supplies of rice from West Pakistan and abroad. The main rice growing area of West Pakistan is Sind. The seasonal inundation of the Indus also permits the cultivation of rice, in other areas of Pakistan. The finest variety of rice comes from West Punjab.

There are now 84 rice mills in Pakistan, all of which are located in East Pakistan.

Wheat: It occupies about 12 million acres of land and gives a yield of 4 million tons a year. It is mostly grown in the districts of Canal Colonies, Peshawar and Hyderabad.

The wheat production in 1959 was 3·8 million tons of which West Pakistan contributed 3·6 million tons. The West Punjab alone accounts for more than 77 p.c. of total production of wheat in the country.

Wheat is cultivated in West Pakistan in the months of November and December and is harvested in May. The average yield of wheat per acre in the Canal Colonies is 700 pounds and in Sind area 600 pounds. The districts of Muzaffargarh, Attock, Jhelum and Sialkot have each between 50-60 per cent of the net cultivated area under wheat. In East Pakistan the monsoon discourages wheat cultivation although in small quantities it is raised in Rajshahi, Pabna and Kushtia. East Pakistan produces 80,000 tons of wheat a year in about 94,000 acres of

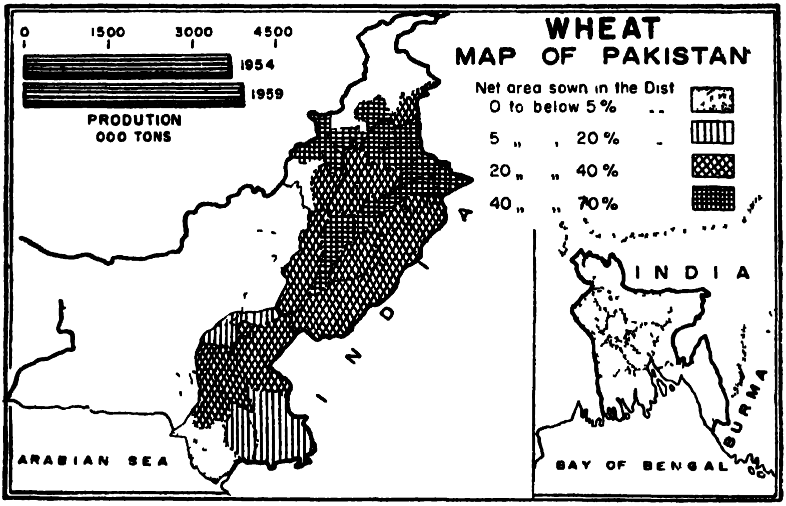


FIG. 81.

land. Within recent years, there has been a decline in wheat yields per acre in Pakistan because of economic and social reasons. Salination, soil erosion and a rise in the sub-soil water table have prevented large tracts of irrigated areas from growing

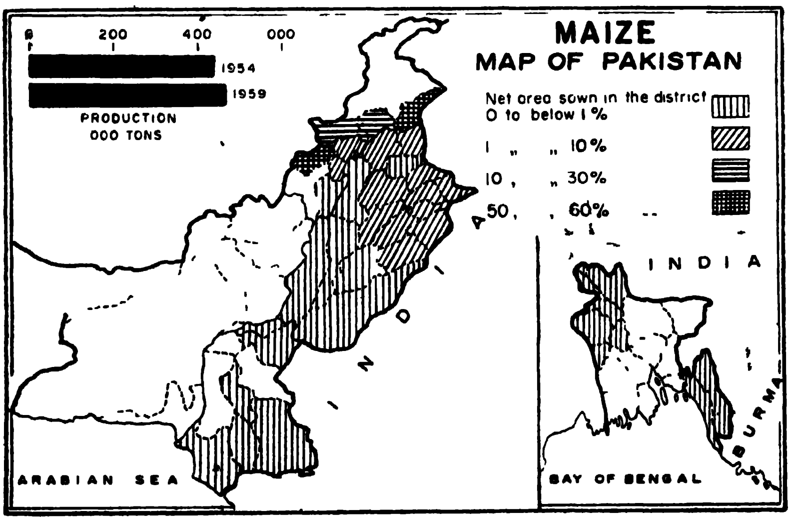


FIG. 82.

wheat crops. The water supply in canals is not adequate and "knowledge of commercial fertilisers and improved farming methods are not generally spread among small cultivators who continue farming according to ancient methods."

A little quantity of *barley* is also grown in Pakistan, most of which comes from Canal Colonies and Peshawar division. Barley occupies about 572,000 acres of land. In 1958, the barley production was 161,000 tons. The other food crops of Pakistan are *Maize, Pulses* and *Gram*. Maize is extensively grown in the West Pakistan. The maize production in 1958 was 445,000 tons in 1 million acres of land.

The districts of Rawalpindi, Attock, Jhelum and Gujarat have the largest acreage under maize. Recently, the acreage under maize has also increased in Sheikhpura, Sialkot and Gujranwalla. In Sind valley, maize producing districts are Sukkur and Hyderabad.

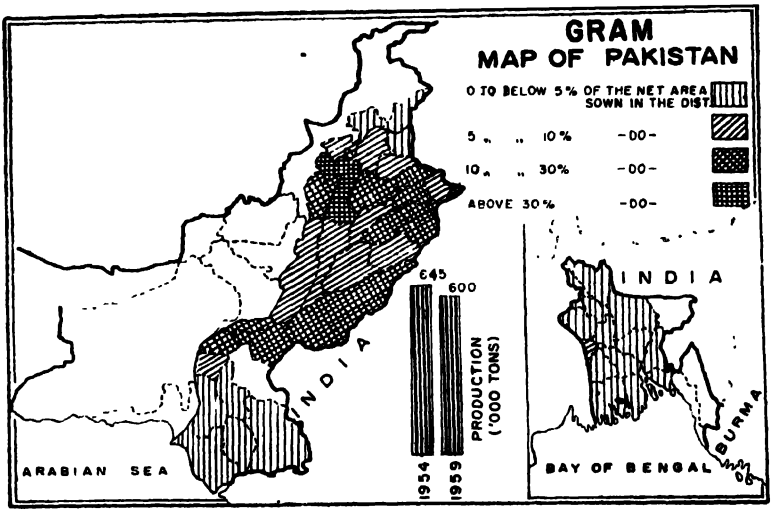


FIG. 83.

Gram covers approximately 3 million acres, of which 98 per cent are in areas drained by the Jhelum, Ravi and Sutlej. Small quantities are also raised in Hyderabad and Peshawar divisions. East Pakistan produced 695,000 tons of gram in 1958. Although gram is cultivated in many districts, the largest acreage under this crop is found in Shahpur, Montgomery and Multan.

The position of Pakistan in the matter of foodgrains is normally satisfactory. There is a surplus of wheat and rice in West Pakistan in almost every year. With improved agricultural methods, extended irrigation, more capital and better communications, West Pakistan would be able to support a population larger than at present.

Taking the average of 1949-50 to 1952-53 as base of production, the food crops increased by 26 p.c. in 1961-62 as against 51 p.c. in the case of non-food crops.

Sugarcane is cultivated in an area of 1·2 million acres of land in Pakistan. The sugarcane tracts are Montgomery, Lyallpur, Sialkot, Peshawar and Lahore districts in West Pakistan, and Dinajpur, Rajshahi, Dacca and Mymensingh

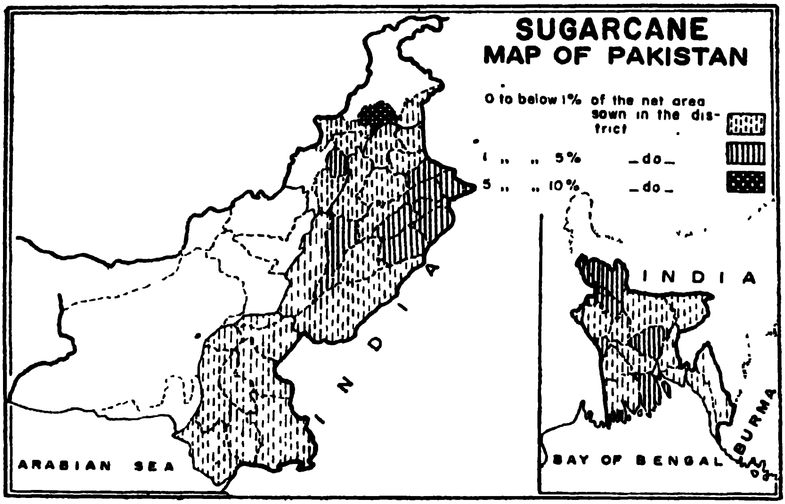


FIG. 84.

districts in East Pakistan. Though sugarcane has always been an important commercial crop in East Pakistan, it hardly occupies 1 per cent of the cropped area. The facts that the climate is too moist, and most of the cultivated areas are low-lying and frequently flooded, make sugarcane cultivation unsuccessful except in areas when the crop can survive these unfavourable conditions. Thus certain jute growing areas also cultivate sugarcane. East Pakistan has about 320,000 acres of land under sugarcane cultivation.

SUGARCANE: ACREAGE AND PRODUCTION

1962-63

	West Pakistan	East Pakistan	Total
Acreage (000 acres)	1,064	317	1,381
Production (000 tons)	14,264	4,890	19,154

Tobacco: Tobacco is an important cash crop of Pakistan. It is mostly grown in East Pakistan. The chief districts are Rangpur, Dacca and Mymensingh. About 50 per cent of the sown area is in Rangpur where tobacco is mainly an irrigated crop. A little tobacco is raised in the Hyderabad and Peshawar divisions.

In 1959, about 201,000 acres of land were under tobacco cultivation with 100,000 tons of production.

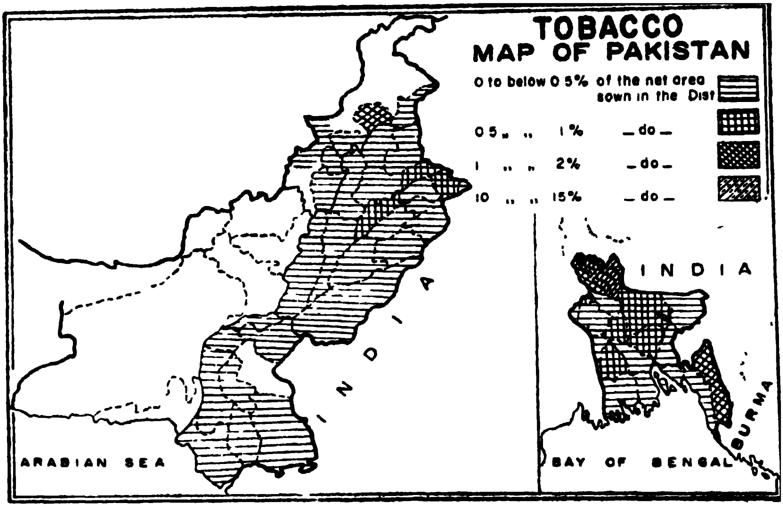


FIG. 85.

Tea: Pakistan is the fifth largest tea producing country in the world being headed by India, Ceylon, Indonesia and Japan. From the point of view of production, however, her share is hardly 5 p.c. of the world production. The tea cultivation was started in East Pakistan as early as 1856 with the Surma valley as the centre. Today, cultivation is confined to Sylhet, Chittagong Hill Tracts and Tipperah where conditions

like elevation, rainfall and soil are highly favourable. The annual production of tea is about 57 million lbs. compared with 709 million lbs. in the Indian Union. At present there are 130 factories in East Pakistan, of which 109 are in Sylhet. About 81,000 acres of land are under tea cultivation in Pakistan. The total acreage allocated to Pakistan under the International Tea Agreement is 83,700 acres.

Pakistan exports about 12 million lbs. of tea yearly. The United Kingdom is one of the best customers of Pakistan tea, though in the total imports of tea in U.K. the share of Pakistan is hardly 1 per cent.

Tea is mainly exported through Chittagong. As the export seasons of jute and tea are the same, there is always a great rush for loading at Chittagong. Recently Chittagong has increased its capacity of handling its traffic to 35,00,000 tons per annum to cope with the traffic. Another problem of the tea industry is the shortage of tea chests.

Although Pakistan tea does not command the prices fetched by Darjeeling or Assam teas, it is valuable in blends.

Cotton: From time immemorial cotton has been cultivated in the Indus valley. The evidence of this was found by the presence of cotton fabrics in the excavations of Mahenjo Daro, unearthing relics of prehistoric civilization. It is the most important industrial crop of the Indus valley, although produced in every part of the Republic. Pakistan contributes about 6 p.c. of the world crop and ranks third as a world exporter.

West Pakistan raises about 97 per cent of the country's cotton. Multan, Montgomery, Lyallpur, Shahpur, Lahore, Sheikhpura and Jhang districts account for 90 per cent of the cotton production. In each of these districts cotton occupies 20 to 30 per cent of the sown area.

In 1962, in about 3·2 million acres of land, Pakistan raised 271,000 tons of raw cotton. In East Pakistan, only about 40,000 acres are under short staple raw cotton, mostly in the Chittagong Hill Tracts.

Since 1948, the production of raw cotton has not increased much. In fact, the yield has declined. There is an explanation: "The influx of refugees into the Punjab and the necessity to settle them more closely, involving a reduction in the size of

the individual holding and the cutting of new irrigation channels has reduced the area of devoted to the growing of cotton, for the individual holder necessarily devotes some part of his plot to growing food requirements for his own." Also, many of

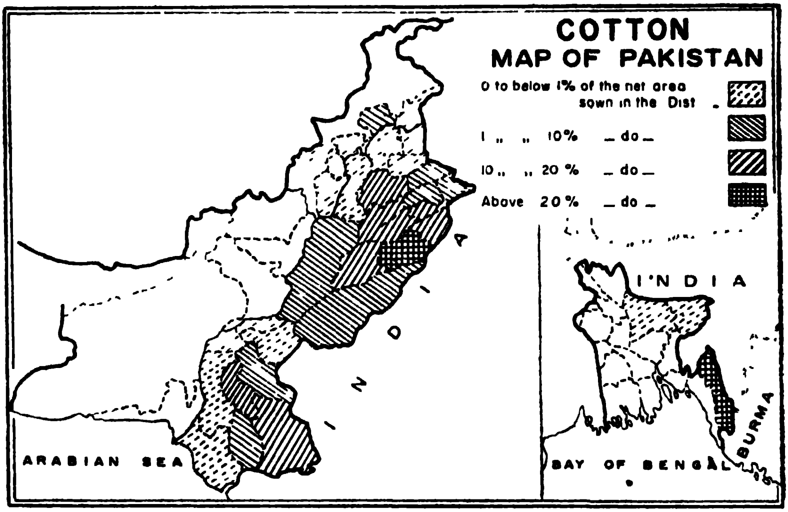


FIG. 86.

these refugees have come from the non-irrigated parts of East Punjab and therefore are not aware of the methods for using irrigation water and for the handling better-quality cotton.

The Lower Indus valley has cotton tracts in the districts of Tharparkar, Hyderabad and Nawabshah where about 900,000 acres of land are under cotton.

Two types of cotton are cultivated in Pakistan—Desi and American upland type. American upland type cotton has been raised in the eastern part of Indus valley which is watered by a perennial canal system and where the climate has plentiful moisture. Such plants need about 7 months of growing season during which time there must be no risk of frost. At present the American varieties account for 90 per cent of the total production and about 75 per cent of the total acreage. Pakistan exports about 40 per cent of her raw cotton mainly to Japan, Hongkong, West Germany, United Kingdom. Of the total production of raw cotton in the country, more than 60 per cent is consumed by the cotton mills and the rest is exported outside.

The extent of demand for raw cotton by the Pakistan cotton mills industry can be judged from the fact that in 1950, the mill consumption accounted for only 9 per cent of the raw cotton production as compared to 60 per cent in 1960. Because of the internal demand the export of raw cotton has declined considerably. With a view to encouraging the export of cotton, the Government has lowered the export duty on short-staple cotton.

Jute: Pakistan holds a dominant position as a producer of raw jute. About 40 per cent of the total world production of jute comes from East Pakistan which has no rival in respect of colour, lustre and spinning qualities of jute. In 1959 a little more than 1·5 million acres of land were under jute cultivation in Pakistan. The average per acre yield of jute in Pakistan is 4 bales as against 2·5 bales in India.

PRODUCTION OF RAW JUTE

(In lakh bales of 400 lbs. each)

Year	Pakistan	World Total	Col. 2 % of Col. 3
1957-58	... 62·17	131·8	47·2
1958-59	... 60·08	150·2	40·0
1959-60	... 65·68	141·0	40·2
1960-61	... 45·00	141·0	31·8
1961-62	... 71·14	N.A.	—

The moist climate of East Pakistan is an ideal one for the growing of jute. The quality and quantity of fibres, however, depend on soils. Jute plant in East Pakistan is grown in three different kinds of soil:—(*a*) the rich sandy loams of the highlands which produce the finest qualities of jute; (*b*) the *Char lands, i.e.,* alluvial soils which are situated in the neighbourhood of the river tracts, and which are flooded during the rainy season—such lands do not require manure; (*c*) the marshes or low-lying tracts on the deltas of the rivers. The chief jute growing area is in the triangle formed by the Lower Ganges-Brahmaputra and Brahmaputra-Surma rivers.

The commercial division of the jute tracts in East Pakistan is as follows:—

1. Narayanganj.
2. Serajgunj.
3. Uttarya or Noithern.
4. Dewrah.

'Narayanganj' jute is grown on the old Brahmaputra river valley in the districts of Mymensingh, Dacca and Tipperah. There is no other jute tract in East Pakistan where water is so clear as that of the old Brahmaputra. Most of the tracts lie under flood water when the jute crop is still on the fields and, consequently, the fibre becomes 'rooty' and 'mossy'. Narayanganj jute is thus considered best in the market.

"Serajgunj' jute comes from the basin of the new Brahmaputra or Jamuna river in the districts of Pabna, Bogra, Rangpur and Western Mymensingh. The water of the Jamuna is nearly as clear as that of the old Brahmaputra.

'Uttarya' or northern Jute is obtained from the highland tracts in the districts of Rajshahi, Bogra, Rangpur, Dinajpur and Malda. The areas are supplied with water from the tributary rivers of the Brahmaputra. As only a limited part of the tract receives a direct supply of water from the river, the jute is to be steeped and washed in ditch-water. The colour of the jute is inferior because the ditch-water which is used for successive steeping becomes coloured.

'Dewrah' jute is grown in tracts watered by the branches of the river Padma in Faridpur district. This jute is very strong but harsh and is suitable for making cordage and sackings.

Mymensingh alone raises more than 70 per cent of the raw jute of East Pakistan. The time for sowing is mid-February to mid-April and harvesting commences in mid-June and continues till early September. *The average yield of jute per acre is 1203 lbs.* Jute cultivation is a very profitable occupation to the peasants in East Pakistan who depend very much on it for their prosperity. Recently, however, the policy of the Government has been to restrict jute-growing to reduce the food crop deficit.

The total export of raw jute from East Pakistan amounts to about 900,000 metric tons. The Government is taking steps to

develop Chittagong so that the port may handle a large volume of export trade

U.K., India, France, West Germany and U.S.A are the principal buyers of Pakistani raw jute The country-wise exports of raw jute from Pakistan during the last five years are given in the following table:

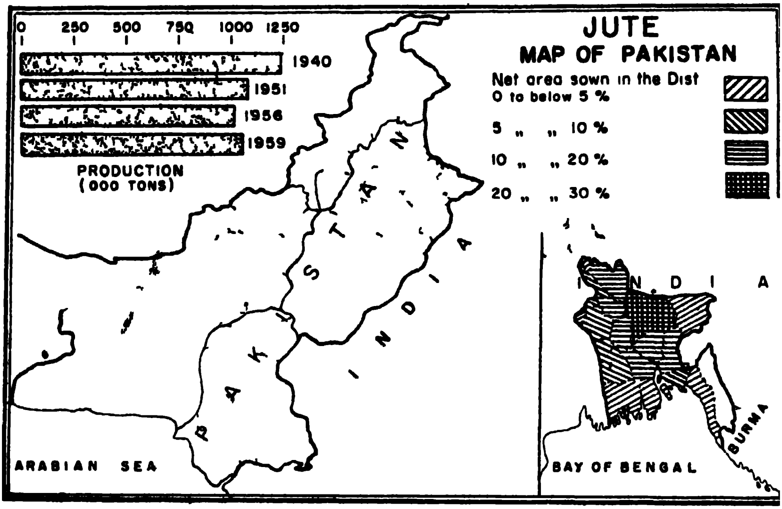


FIG 87

(In thousand bales of 400 lbs each)

Year	U K	India	France	West Germany	U S A	Other countries	Total
1957 58	658.5	636 4	520 8	471 9	237 8	2047 5	157- 9
1958 59	867 9	174 9	397 4	446 4	286 8	2221 0	4394 0
1959 60	753 9	622 8	401 8	375 3	307 7	2256 9	4718 4
1960 61	568 1	371 3	211 1	231 0	87 2	1520 3	2989 0
1961 62	699 7	391 9	337 0	251 2	N A	2397 8	4077 6

The most outstanding landmark in the history of jute in Pakistan has been the establishment of a Pakistan Jute Committee in August 1950 The Committee undertakes agricultural, technological and economic research, improvement of crop fore-casting and statistics, production testing, etc.

Many countries in view of recurrent jute shortages and the practical monopoly of this product held by East Pakistan have made experiments with substitutes. The Congo cultivates

Urena Lobata (a wild fibre plant indigenous to all tropical Africa) and has achieved an annual production of several thousand tons. A factory for making sacks from this fibre has been established at *Leopoldville*. A similar but less good quality fibre is that known locally as *punga*. Production of these two fibres in Congo is to be stepped up during the ten-year plan from the present level of 11,000 tons to 24,000 tons per annum. Java has become almost self-sufficient so far as sugar bags are concerned by cultivating extensively a jute-like fibre called *Rosella*. A similar fibre called *Kenaf* is grown in China (Manchuria) and is used for making bags for soyabeans. *Manila hemp* in the Philippines and *Polompon* in Indo-China are similar to jute. Conscious of the dangers of the substitute fibres, Pakistan has endeavoured to maintain a competitive price for jute in the world market. At the same time, the Government is anxious to see that the growers get a fair return.

Of late, Pakistan has been giving incentive for the export of mesta to markets which are interested in cheaper lower grade jute. It may be noted that cheap mesta from Thailand has made considerable inroads into the traditional markets of Pakistani raw jute.

Oil-Seeds: Pakistan is deficient in the production of oil-seeds and has to import her requirements from outside. About 2 million acres of land are under oil-seeds cultivation in Pakistan. The important oil-seeds are rape-seed and linseed. East Pakistan is better placed in respect of oil-seeds, though the quality is inferior.

AREA AND PRODUCTION OF OIL-SEEDS (average 1956-59)

(Sesamum, groundnuts, rape and mustard, linseed and castor seed)

	In '000 acres	In '000 tons
East Pakistan	700	150
Canal Colonies	400	70
Lower Sind Valley	300	40
Peshawar Division	80	5
Others	420	115
Total	1,900	380

Linseed is mainly grown in East Pakistan where 68,000 acres of land are under this crop, out of Pakistan's total of 78,000 acres. Pakistan is an important producer of cotton seeds which have in the past normally been consumed mainly as cattle food.

Forests

Forests cover about 18,438 square miles of land in Pakistan, which is only 3 per cent of the total area. Thus, the area under forest in Pakistan is much less than the optimum required for the economy of the State. Fortunately, however, there is ample scope for the extension of forest areas both in East and West Pakistan.

Sind valley and north-western part of West Pakistan are poorly forested, as these are mostly arid areas. The position of south-eastern part of West Pakistan is no better, about 2 per cent of the area being covered by forests. East Pakistan has, however, considerable areas under forests along the southern coast as well as in Chittagong. Thus Pakistan's forest resources are much less than its requirements and a suitable forest policy is required to meet the situation. Broadly speaking, the forests of Pakistan can be classified into six groups, the first three being in West Pakistan and the remaining in East Pakistan. (1) Coniferous forests extending over Hazara, Malakand, Rawalpindi, Dhir, Chitral and Swat. The trees are spruce, fir etc. (2) Submontane forests in the northern districts of the former West Punjab and Baluchistan with trees like *Kao, pine* and *phulai.* (3) Riverine forests of the Indus basin with *babul* and *sisham.*

In East Pakistan, the forest groups are as follows: (*a*) the forests along the eastern boundaries with main species like garjan and bamboos; (*b*) the Sunderbans tidal forests of *sundri;* and (*c*) the low-lying plains, forests of Dacca and Mymensingh with *sal* as the main specie.

AREAS UNDER FORESTS IN PROVINCES (1958)

East Pakistan .	8,558	North West Frontier ...	2,250
Sind Valley ...	2,473	Bahawalpur ...	85
West Punjab ...	2,558	Khairpur ...	27
Baluchistan Plateau ...	2,478	Total ...	18,438

About 50 million cubic feet of forest wood is annually available in Pakistan of which 70 per cent is firewood and 30 per cent timber. The share of West Pakistan and East Pakistan in the forest wood production is almost equal.

The major forest products in East Pakistan are timber and fuel, the annual output of which is about 15 m. cu. ft. Among minor forest products, East Pakistan produces 81 m. stems of bamboos, 800,000 canes, over 492,000 lbs. of honey and 120,000 lbs. of wax a year. The Hill Tracts of Chittagong are most difficult to pass through—as these are tangled mass of hills, ravines and cliffs, covered with dense tree, bush and creeper jungle. The highest point in these hills is 2,800 ft. There are several species of timber in East Pakistan which are yet to be exploited. The scope for utilizing less important wood species and other products like drugs, canes, bamboos and grasses is being seriously considered in East Pakistan, which in the absence of mineral resources, will have to depend on forest industries to a large extent for its economy.

The principal trees which yield timber in Pakistan are the following:—

(*i*) Babul in Sind valley, Baluchistan Plateau and the central region of West Pakistan.

(*ii*) Blue pine in North-western Region and North-eastern Region of West Pakistan.

(*iii*) Garjan in East Pakistan, used for boat-building and packing cases.

(*iv*) Gamari in East Pakistan used for boats, buoys and packing cases.

(*v*) Sundri in East Pakistan.

(*vi*) Bamboo is an important plant throughout the eastern part of East Pakistan and serves a number of uses. It grows abundantly in Noakhali, Tipperah, Mymensingh, Sylhet and Chittagong. As the price of bamboo is very cheap, its use in villages has become common for framework, walls and roofs of houses.

Pakistan is deficient in paper pulp and cellulose. It is, however, apparent that she is more or less self-sufficient in timber for furniture, agricultural implements and sports goods,

etc. She is short of material for building and and heavy construction, of railway sleepers and of timber for packing cases and tea chests. Both in West and East Pakistan, the over-exploitation of forests for fire wood and excessive grazing have pushed the forests into areas which are almost inaccessible. The Government have formulated a new forest policy to maintain and develop the supply of fuel and fodder, timber and other forest products.* A Forest Research Laboratory at Chittagong is being set up.

Mineral Products

The present position of Pakistan in respect of mineral wealth is not very satisfactory, although she is endowed with diversified mineral wealth. Her great unexplored areas, however, afford promising fields. Till proper surveys are undertaken and new fields discovered, Pakistan will have to depend on foreign sources for basic minerals of industrial value. Several areas are under examination, and it may be possible to get *iron deposits* in the North Western part of West Pakistan, *manganese* in Chitral, Kohat and Baluchistan, *copper* in Baluchistan, Chitral and Waziristan, *mica* in Hazara district and Baluchistan plateau and *bauxite* in Baluchistan. Substantial *deposits* of *coal of good quality* are lying below 250 feet in Baluchistan plateau. Experiments in laboratories show that this coal, though not fit for use in boilers and allied purposes, is rich in many other valuable properties. The production of. sulphur, coal, coal gas and distillation products extracted from this coal holds out promise for immense industrial development. In addition to this, coal brickets and coke brickets can also be produced from the existing coal mines which can be used in boilers and for domestic purposes respectively.

The mineral situation in Pakistan will demand serious consideration of the authorities. The country is in a somewhat anomalous position in that most minerals of industrial importance are located in Baluchistan, Chitral and the western fringe

*"Regular planting and felling is now being attempted on the principle of sustained yield, so that trees are treated as perpetually renewable crops . . . Seedlings have been provided free of cost by the local forest departments for tree planting throughout the country." *The Economy of Pakistan* by Andrus and Mohammed, p. 109.

of West Pakistan, but no minerals are mined in areas where the greater number of manufacturing industries are located and denser population exists. The industrial and commercial exploitation of most of the minerals of Pakistan will depend on the

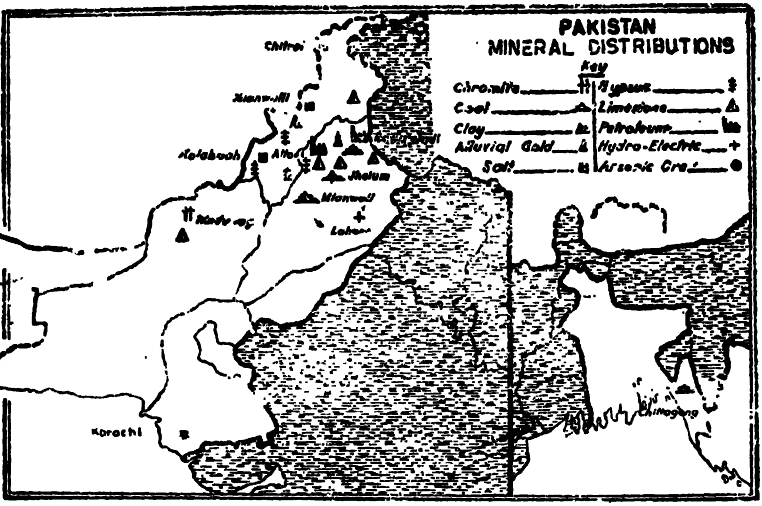


FIG. 88. Note the absence of minerals in East Pakistan. Coal and Petroleum deposits may, however, be found later.

development of cheap and rapid transport. Recently, good progress has been made in regard to both exploration and actual mineral production with Colombo Plan aid.

The important minerals of Pakistan are Chromite, Petroleum, Salt, Saltpetre, Gypsum, Limestone, Clay, Fuller's Earth and Antimony. The mining industry employs about 20,000 workers in Pakistan.

FUEL AND MINERAL PRODUCTION (TONS) 1961

Chromite	...	25,000	Rock salt	...	198,601
Limestone	...	1,176,000	Natural gas (000 c.u. ft.)	...	34,308,060
Gypsum	...	99,000	Coal	...	906,000
Iron ore	...	3,097	Petroleum		2041,809 (barrels)
Bauxite	...	405			

Chromite: In Baluchistan plateau, chromite has been mined since 1901. In the past 30 years, a total of 600,000 tons of chromite has been mined and exported. The Hindubagh area of Baluchistan is said to have the second largest chromite deposits in the world.

CHROMITE PRODUCTION

(In '000 tons)

1947	20
1953	24
1954	22
1958	23
1959	16

At present, almost the entire production of chromite is exported. There is little demand inside the country.

Deposits of chromite are found in Kharan, east of Raskoh and in Chagai district west of Raskoh in Baluchistan plateau. Some deposits are also available in Chitral and extreme north-western part of West Pakistan.

Manganese: Four small deposits of manganese have recently been located in Lasbela and Kalat. The manganese oxide contents are between 40 and 50 per cent, and the total quantity available has been estimated at 500,000 tons. Copper ores are extensive in the Raskoh range in Baluchistan. They are found in two forms—firstly as *oxide* associated with garnet rocks, and secondly as *sulphides* associated with magnetite. At present copper is not mined in any part of Pakistan, though further prospecting is expected to be undertaken soon.

Iron ore: The most significant iron ore deposits are those in Chitral. Other areas are Attock and Sargodha districts, and Mardan in the north-east of Peshwar. The iron ore deposits have 40 to 60 per cent iron contents. The commercial workable reserves of these deposits are not yet known. Several small veins of magnetite have been found in the northern side of Raskoh in Baluchistan plateau. At present iron ore is being worked in Kalabagh.

Minerals	Annual Production	Areas of Production
Gypsum ...	The production was about 99,000 tons, in 1961. The reserves are estimated at over 30 million tons. The use of gypsum as a raw material for the production of fertilisers in Pakistan is now under active consideration of the Government.	Jhelum, Shahpur and Mianwali in West Pakistan, Baluchistan plateau, Sind valley and Kohat. Large deposits of Gypsum have also been found in Dera Ismail Khan.
Fuller's Earth ..	This clay is non plastic in nature and is used as filler in soap and paper and in paints.	West Pakistan: Canal Colonies, Kohat, Malakand and Sind valley.
Salt* ..	177,000 tons in 1958. West Punjab salt mines produce about 60 lakh maunds of salt, while the Kohat mines yield between 7 and 8 lakh maunds. The production of sea salt is about 41 lakh maunds.	The important field for rock salt is in Kohat. Common salt is manufactured at Mauripur in Sind valley. East Pakistan does not produce any salt.
Limestone ..	The production of limestone was 1.1 million tons in 1961.	Attock, Jhelum and Rawalpindi and St. Martin's Island (E.P.) Deposits are also available in Jessore (E.P.)
Clay ...	Large quantity. Production is about 16,000 tons.	Fire clay in Dera Ismail Khan dist. Ochre and other coloured clays in Chitral.
Antimony .	Large reserve—but not developed yet.	Chitral and Kalat. The inaccessibility of the neighbourhood, its elevation of 13,500 ft. and its climate, which is rigorous enough to limit work to 2 or 3 months in the year, have hindered any active exploitation up to the present time at Chitral.
Alluvial Gold ..	Small quantity.	Jhelum district in West Pakistan. At present gold is obtained by gold-washers from surface gravels only. Attempts are being made to work deeper gravels for gold.
Granite ...	20,000 tons.	West Pakistan: Kohat, Abbotabad.

* Rock salt deposits are worked in the well-known Salt Range, covering parts of the district of Jhelum, Shahpur and Mianwali. Near the village

Power Resources of Pakistan

One of the foremost needs of a modern nation is the source of mechanical energy, either coal, oil, natural gas or water-power. In view of the various development programmes that have been undertaken by Pakistan for industry, transport and agriculture, the use of power is on the increase rapidly. At the time of Partition, little was known of the fuel resources of Pakistan. Immediately after 1947, prospecting and survey work was started. The installed capacity is at present 416,000 kw of which 127,000 kw is thermal and 63,000 kw hydro-electric. As the demand for power had gone upto 804,000 kw in 1960, a number of schemes for power installation are being worked out to raise the installed capacity to 1 million kw.

Coal : Both in quality and quantity Pakistan is today poor in *coal.* Of the known deposits in Pakistan, the principal and prospective coal producing localities are situated in West Punjab and Baluchistan. As early as 1893, an output of 100,000 tons of coal was raised in Punjab of which the Salt Range mines contributed 75,000 tons. From 1950 onwards, the Baluchistan fields have surpassed the Punjab field in output. In 1961, the coal production in Pakistan was a little more than 900,000 tons of which Baluchistan raised about 60 per cent.

The principal coalfields are in Sharigh and Harnai on the Sind-Pishin railway and in the Bolan Pass, also in Sor Range in the Quetta-Pishin district. Pakistan coal, however, is "high in volatile matter, often very low in ash and remarkably rich in organic and pyritic sulphur". The Pakistan coal is mainly used in cement kilns and brick burning. There are possibilities of using this coal after mixing with imported steam coals for the generation of electric power, railways, cotton mills, glass factories and ice plants. It is estimated that West Pakistan contains 366,000 million tons of coal reserves.

of Khewra, the main seam has an aggregate thickness of 550 ft., of which five seams with a total thickness of 275 feet consist of salt pure enough to be placed on the table. The associated beds are impregnated with earth, and in places there occur thin layers of potash and magnesium salts. Open quarries for salt are developed a short distance to the east—north-east of Kalabag on the Indus and similar open work is practised near Kohat, where the quantity of salt may be regarded as practically inexhaustible.

Probable Workable Reserves

Baluchistan Region	... Khost Sarig	... ...	30,900,000 tons
	Sor Range	... ...	17,990,000 ,,
	Deghari	... ...	3,900,000 ,,
	Mach	... ...	15,000,000 ,,
Central Pakistan	... Makarwal	... ...	6,270,000 ,,
Salt Range	.. Dhak Dandet	... ...	5,250,000 ,,
	Pid Dandet	... ...	10,500,000 ,,
	Rakh Drengen	... ...	13,800,000 ,,
	Rakh Makaila	... ...	18,000,000 ,,
	Dahk Katha	... ...	5,200,000 ,,
			165,500,000 tons

In the north-western region of West Pakistan, there are three possible coal areas: (*a*) The Dore river of the Hazara district, (*b*) Kohat district just north of the Baroch gorge, and (*c*) Mira Kwand in the Spli Toi in South Waziristan. In Baluchistan plateau, the Khost area is an important coal-field.

In East Pakistan, on the other hand, coal, from all present indications, is entirely lacking. Because of this, East Pakistan has had to depend on imports for her needs. The coal comes from West Bengal. The eastern part of Chittagong contains coal deposits, but it is doubtful whether the area can develop its potential immediately.

Pakistan's total annual coal requirements under the present circumstances are about 3 million tons. The country imports coal in increasing quantities from South Africa, China, Britain, France and Poland. South Africa alone can meet Pakistan's coal requirements for industrial and domestic purposes, although this coal is slightly inferior to Indian coal and unsuitable for locomotives. As South Africa has her own mercantile marine, this coal can be cheaper than Indian coal so far as Pakistan is concerned.

To bridge the gap between internal production and consumption of coal, the Pakistan Government has spent a considerable amount of money to increase the output of coal mines in West Pakistan. There are, however, many handicaps, *e.g.*

(*a*) A large number of separate units which are incapable of undertaking long term investments;

(*b*) Lack of mining and transporting equipment, and lack of pumping facilities;

(*c*) Lack of suitable stores and materials at the mines, such as good quality timber for the support of underground workings;

(*d*) Poor approach roads to the mines and inadequate transport facilities to railhead for the coal produced;

(*e*) An unstable labour force and lack of trained miners.

Petroleum

Among all the mineral resources of Pakistan, *petroleum* is the most important. The total production of crude oil in Pakistan in 1959 was 79·5 million gallons.

Khaur Field	...	..	600,000 gallons
Dhulian	...	...	34,000,000 ,,
Joya Mair	...	.	6,000,000 ,,
Balkassar	...	...	22,000,000 ,,

Although geological formations give evidence of oil in several regions of West Pakistan, only one is as yet a significant producer. This region is composed of two fields—Khaur and Dhulian at Attock formerly in West Punjab. In 1929, the *Khaur field* had its maximum production of oil—480,222 barrels. Since then its output has declined rapidly. All the same, the field will remain an important producer for many more years. The *Dhulian field* reached its maximum in 1941 and its output too declined after that.

These two fields were developed by the Attock Oil Company in 1915 and 1937 respectively. The fields are located about 20 miles south of the outer foot of the hills of the Himalayas, Production in these two areas has been around 20 to 36 million gallons a year in recent years. The refinery is at Rawalpindi at a distance of 56 and 67 miles from Khaur and Dhulian respectively. Oil from these fields is brought in a pipe-line to the refinery at Rawalpindi.* Joya Mair, a new oilfield, about

* So far as petroleum refinery is concerned, Morga (Rawalpindi) processes both its own oil production and the oil produced by Pakistan Petroleum Limited.

40 miles south of Rawalpindi, has also started production. This field holds out promise of greatly increased oil output in West Pakistan.

West Pakistan petroleum industry engages about 3,500 workers. Development work is being carried out in Sind valley, where the drilling has now exceeded a depth of 9,000 feet.

Pakistan can at present meet only 20 per cent of her requirements of petroleum from domestic production. There are many possible areas of oil production in West Pakistan. The Kohat Salt region, North Waziristan, Dera Ismail Khan and Bannu districts may yield in future considerable oil. But, at the same time, it is to be noted that in many parts of the Punjab and the Baluchistan area the rock-fields have been too deeply truncated by agents of denudation or have been dislocated by earth movements and many of the original stores of oil have disappeared; oil seepages are common enough, but most of them appear to be mere "shows not connected with reservoirs that can be tapped by artificial means." In East Pakistan, oil indications are present in the districts of Sylhet and Chittagong.

Pakistan Government has made an agreement with two British and two American oil companies for setting up an oil refinery at Karachi. The initial refining capacity will be 1·5 million tons of crude oil with the prospect of expansion up to 2 million tons. The refinery is to start operation soon.

Prospects of Natural Gas

A vast reservoir of natural gas was discovered at Sui in Baluchistan in 1953 which, when fully developed, will revolutionise the industrial and economic development of two-thirds of West Pakistan* Apart from thermal power, the Sui gas will form the basis of variety of chemicals useful in the production of plastics, rayons, resins, silicons, refrigerants and carbon black, used in the printing industry. The Sui project is being developed by the Pakistan Industrial Development Corporation in co-operation with the Burma Oil Company. Four wells have now been sunk, and the supply is to be 100 million cubic feet

* It has been estimated that when the full capacity will be reached, there will be a saving in foreign exchange to the extent of Rs. 44 million.

of gas per day (which is equivalent to 1·6 million tons of coal for thermal power) for 60 years at a stretch. The reserves are estimated to be over 2,250,000 million cubic feet. In 1961, the production of natural gas was 34 million (000 cu. ft.). There is a pipe-line of 350 miles from Sui Range to Karachi to transmit 50 million cubic feet of gas per day for agriculture and industry. A second pipe line from Sui to Multan supplies gas to industry. Recently, a pool of natural gas has also been discovered in Sylhet in East Pakistan. The gas is superior in quality to Sui gas and is available in sufficient quantities to meet the requirements of East Pakistan for 30 years. With a pipe line from Sylhet to Dacca, which is under contemplation, the fuel problem of Dacca—Narayangunj area will be greatly solved.

Water-power

There is considerable scope for the development of hydro-electric power in Pakistan. It has been estimated that Pakistan's hydro-electric potential is to the extent of 6 million kw. The present installed capacity is only for 63,000 kw. Already four hydro-electric projects are being worked out. These are (*a*) the Karnafuli Project in East Pakistan, (*b*) the Rasul hydro-electric scheme (West Punjab), (*c*) the expansion of the Malakand Station in the former N.W.F.P., and (*d*) the Dargai Station near Malakand. *The Malakand Hydro-electric plant* which was the main station in the country till 1948, supplies power to cement works at Wah and electricity to 88 towns and villages in Mardan, Peshawar, Kohat and Hazra. The plant is located at Jabbon on the Malakand Pass and utilises the Swat river for generating power.

The Rasul Hydro-electric scheme is by far the most important project of Pakistan. It utilizes the head available from the Upper Jhelum canal into the Lower Jhelum canal. The project has installed capacity of 22,000 kw. of firm electric power and about 20,000 kw. of secondary power for several towns (in West Punjab) as well as for lift irrigation.

The Karnafuli Project at Silchar in East Pakistan contemplates harnessing the waters of the river Karnafuli for the development of power. The industrialisation in East Pakistan is handicapped by lack of power. More than 500 thousand million

cubic feet of water are poured into the Bay of Bengal by the Karnafuli. About four-fifths of this will be utilised in the new scheme, bringing about a balanced development of industry and agriculture. This multi-purpose Project will develop ultimately 160,000 kw. of energy. Chittagong, Chandpur and Comilla will be served from this source of power. In addition, the project will provide navigation facilities up to the mouth of the Karnafuli, irrigation facilities to an area of 70,000 acres and control of floods. The present capacity of the Project is 80,000 kw.

The Warsak dam, when completed, will raise the water-level of the Kabul River by about 150 ft. This will provide water for irrigation of nearly 60,000 acres on the right bank of the river and 5,000 acres on the left bank. The Warsak Project which is multi-purpose in character will help 1,000 tribesmen settle on new land, and supply them with power for local industries. It will make the Kabul river navigable. The Kabul River Canal will also enable afforestation to be carried out over large areas on the lower slopes of the Peshawar hills. These forests will ease the problem of fuel shortage in Peshawar, while employment in forests will absorb a further number of tribesmen. All these are subsidiary advantages of the Warsak Project. The most important is the power scheme which will generate 160,000 kw. to industrialization for benefit of the whole of Pakistan. The marble quarries at Mullegori, the coal mines in the Sharat Hills and the gypsum and copper mines in Mohammand territory will obtain power from the Warsak plant.

The other projects under construction in West Pakistan are (*a*) the Chichoki-Mallian hydro-electric project, (*b*) the Kurran Garhi multi-purpose project (N.W.F.P.).

Fruit-production

Both from the standpoint of variety and volume, Pakistan is, indeed, very rich in fruits. Almost all the provinces in the State grow fruits on a commercial scale. The annual production is about 3 million tons. Between 60 and 70 per cent is consumed in the State and the rest is exported.

The total area under fruit cultivation in Pakistan is about 409,500 acres.

Fruit Acreage

Areas	Acreage
East Pakistan	200,000
Northern Region of West Pakistan ...	150,000
Sind Valley	50,000
Baluchistan Plateau	8,000
North-Western Region of West Pakistan	1,500

East Pakistan is noted for mangoes, pine-apples and bananas. Mangoes are raised in abundance in Rajshahi, Bogra, Dinajpur and Rangpur. Bananas come from Dacca, Faridpur, Noakhali and Bakarganj. Excellent varieties of pine-apple are grown in Sylhet which before the Partition was a very important supplier to undivided Bengal. Sylhet also produces oranges.

West Pakistan has much developed the fruit industry in Rawalpindi, Jhelum and Attock districts. The Murree Hills may be considered as the fruit garden of the region. Oranges, mangoes, lemons and sweet limes are the principal fruits in the central region of West Pakistan. There is a plan to grow, on commercial lines, apples, walnuts, almonds and olives in the Murree Hills.

The north-western region of West Pakistan grows pears, peaches, figs, plums, bananas and mangoes. Figs, peaches and pears are in great demand both in the country and in the Indian Union. *Baluchistan* plateau depends for its economy on fruit trade. Grapes, apples, apricots and musk melons are grown extensively for markets in Pakistan and the Indian Union.

Lower Indus valley has a large production of grapes and dates. Dates are also grown in Bahawalpur.

In spite of the large production of fruits in Pakistan, the *fruit canning industry* is yet to be developed on modern lines. There are certain difficulties in the way of developing the fruit canning industry in Pakistan. Peaches and other fruits are often affected by fruit-fly. Uneven ripening of peaches is another problem as it affects the uniformity of the canned product. Other difficulties are the inadequate supplies of tin and bottles, the high cost of sugar and the lack of a stable market. Peshawar is now the only centre of the fruit canning industry in Pakistan. Pakistan, however, promises to be a very important source of fruits in the near future for world markets.

Livestock Population

Livestock plays a very significant role in the agricultural economy of Pakistan as it is the only source of power for various agricultural operations. The relief and climate of Pakistan are generally suitable for livestock population. "Certain breeds of cattle have achieved world reputation for draught purposes."*

LIVESTOCK POPULATION (1954)

	In millions		In millions
Cattle and buffaloes ...	30	Horses & Mules ...	1·3
Sheep	7	Camels	·4
Goats	10		

The climate of south-western part of West Pakistan does not produce good pasture, so that in those areas cattle are not so important as in the eastern part of West Pakistan. Although the number of cattle is large in East Pakistan, the quality is inferior in regard to milk and meat production. The grass has a deficiency in phosphorus and this makes cattle liable to disease.

In East Pakistan, heavy rainfall does not encourage rearing of sheep and buffaloes. Nor can camels stand the climate. Cattle and goats, however, are mostly found in this area. In West Pakistan, camels are mostly found in Sind Valley and Baluchistan Plateau. Hyderabad and Peshawar Divisions support a large number of sheep. Buffaloes are mostly found in the Lahore Division. "There is an important horse population, used mainly for transport, and the Punjab is particularly reputed for its breeding farms which have in the past concentrated on breeding horses for the army and also for racing".

The principal products are meat, milk, hides, skin and wool. The annual requirements of meat are in excess of the domestic production. Efforts are being made to increase the output of meat by 1·4 per cent each year for maintaining the present consumption of calories coming from livestock products. The *dairy industry* has developed in the districts of Montgomery, Lyallpur

* However, the lack of proper breeding, inadequate feeding and pests and disease account for the poor quality of the livestock population in Pakistan.

and Multan. The *leather industry* is of growing importance. The annual average production is as follows: cow hides (4·5 million pieces), buffalo hides (·8 million pieces), goat-skin (5·3 million pieces) and sheepskin (2·0 million pieces). As raw materials are plentiful, the tanning industry has great prospects in Pakistan. *The annual production of raw wool in Pakistan is about 28 million lbs.* Practically all wool is good only for making carpets.* Superior grades of wool are also available but these are in small quantities. The best wool comes from Sind Valley and Baluchistan Plateau. Wool became a particularly valuable economic asset to Pakistan after the country's independence in 1947. It ranks third in importance among her exportable commodities. From the country's seven million sheep about 28,000,000 lb. of wool is produced annually. Pakistan also imports wool from Afghanistan, Iran and places on the Persian Gulf. The chief buyers of raw wool are the U.K. and the U.S.A. Pakistan is not likely to develop an export trade in meat although her leather export is important.

Fisheries

The Pakistan fishing industry, while nationally not as important as agriculture and livestock industries from the standpoint of value of products and numbers of men employed, is nevertheless, of vital importance to the economy of East Pakistan as well as of the Sind coast. About 800,000 people are in the fishing industry of Pakistan.

Being bounded on the south by the Bay of Bengal and having numerous rivers, streams and *bils*, East Pakistan is preeminently a fish producing area. Fresh fisheries in East Pakistan perform an important function by adding to the food supply. In East Pakistan, any diminution of activity in the fishing industry results profoundly in worsening the food position. The annual output is far beyond the consuming capacity of the province and, therefore, can be exported to the Indian Union. Boats are extensively used for carrying fish to rail or

* Most of the wool Pakistan produces is classed as carpet wool in international markets. The quality is considered excellent and is therefore in great demand overseas. The growing importance of this trade to Pakistan led to the adoption of a scheme of compulsory grading of all wool intended for export.

steamer heads at Narayanganj, Chandpur and Goalundo. The important catches are rohu, hilsa, catla and prawns. Fish like kai, magur, singi and sal are abundant in ponds and *bils* of East Pakistan where Government are taking a keen interest in the development of fisheries on modern scientific lines. Their rural pisciculture scheme has recovered many tanks and large bighas of water. Besides this, the Government has undertaken a 10-year scheme for the reclamation of derelict tanks and water-logged areas for the purpose of using them for fish production.

The estimated annual production of fresh fish in East Pakistan is over 33 million maunds. About 70,000 tons of sea fish are also caught annually along a 300 mile coast-line.

In West Pakistan, the industry is concentrated along 550 miles of coast. The entire sea-coast of West Pakistan is important for the fishing industry. The production of sea-fish off the Baluchistan coast is about 93,000 maunds a year.

Lower Sind has a coastline of about 200 miles studded with creeks. The Indus brings silt and other materials in the delta which provide food for fish. For about 80 miles from the coast, the depth of the sea is nowhere more than 100 fathoms. Thus the Sind coast has become an important fishing ground.

TOTAL PRODUCTION OF FISH IN PAKISTAN

(in metric tons)

	1957	1955	1951
East Pakistan ...	215,544	193,000	176,000
West Pakistan ...	67,256	63,000	60,000
	282,800	256,000	236,000

The catches are prawn, salmon, mullet, pomfret, mackerel and hilsa. Sind is a great exporter of fish. The Sind Government is carrying out systematic work in preparing and analysing the oils obtained from the liver and body of fishes, such as skates, rays and other varieties which were hitherto not utilized. As a result of the utilization of these fishes, it will be possible to manufacture glue and gelatine. The Baluchistan coast is about 350 miles long. There are bays and backwaters

but no discharge from rivers. Fishing is carried on within 10 miles of the coast. Fishing is practised from September to May because in June, July and August, the sea is rough.

Thus it will be observed that between 1951 and 1957, the production as increased by about 50,000 tons. "The greatest handicap to higher production is the lack of adequate investigations of the available fishing grounds along the extensive coastline in both wings of the country and the virtual absence of satisfactory facilities for handling, processing and marketing fish." One of the handicaps of Pakistan fishing industry is the lack of powered fishing boats and modern gear. The fish harbour at Karachi is being developed for mooring boats, establishing wholesale fish market and cold storage and ice plants. Similar facilities will soon be available at Chittagong. The Mekran Coast in West Pakistan is also being provided with facilities for cold storage and ice plants.

Fish is an important foreign exchange earner of Pakistan. Fresh water fish of East Pakistan is exported mainly to West Bengal. The dry salted fish is imported by Burma, Ceylon and Malaya from West Pakistan.

Manufactures

"The most striking feature of Pakistan's present economy is the marked contrast between its vast natural resources and its extreme industrial backwardness." Pakistan produces more than 40 per cent of the worlds raw jute, 1·5 million bales of good quality cotton, abundant quantities of wool, hides and skins, sugar-cane, tobacco, fruit and fish. The resources in minerals are also considerable. Industrially, however, the backward position has been the result of certain forces: first, in the early years of the last century, organised industries were located in Calcutta, Bombay and Ahmedabad; secondly, during the World War I, the movement in the development of manufactures started in the central regions like Indore, Kanpur, Nagpur, Tatanagar and Jabalpur; and thirdly, technical institutions, research laboratories, credit and service agencies have developed mostly in Calcutta, Delhi, Madras, Bombay, Kanpur, etc. Thus, the regions now constituting Pakistan were not industrially developed at the time of partition. In recent years, however,

various industries have been developed in Pakistan. In a number of articles, the country has already become self-sufficient. "The availability of many kinds of raw materials, and the desire to diversify its economy so as to be less vulnerable to the instability of foreign demand for its primary exports and less dependent on foreign supplies of manufactured products, led Pakistan to launch its vigorous programmes of industralisation."

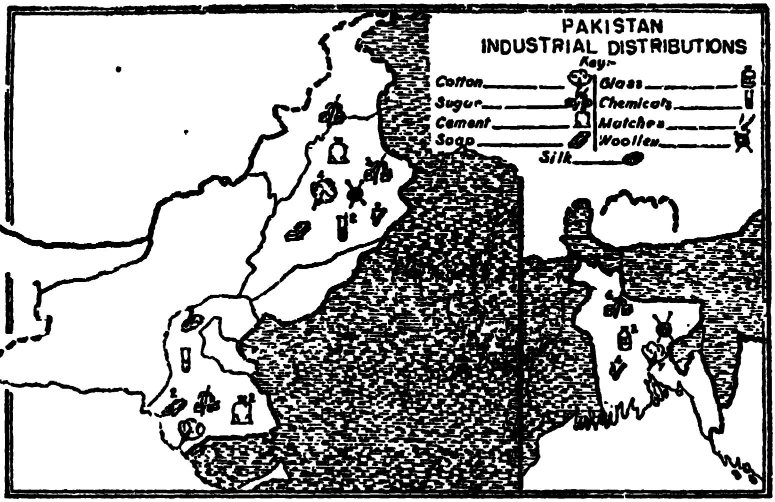


FIG. 89

About 662,000 persons are employed in the main industries of Pakistan of which railways have 150,000 workers.

The future of Pakistan, however, in matters of industrial development is quite bright. A number of minerals like coal, iron and oil are likely to be discovered in good quantities on a proper geological survey although it will take time. The present shortage of capital goods and capital for the expansion of various industries for which raw materials are available, will not remain a problem for ever. She can depend upon external sources for capital to finance equipment for the development. The Government's direct investment and its stimulation of private investment have been very useful in the industrial development of the country. In July 1960, the Pakistan Government initiated the Second Five Year Plan for industrial develop-

ment programmes which will cost Rs. 1,900 crores. The principal goals of the second plan are:

(*i*) To increase national income by 20 per cent. After allowing for the increase in population this will mean 10 per cent increase in the per capita income.

(*ii*) To increase the production of foodgrains by over 20 per cent. This will make the country self-sufficient in food by the end of the Plan period.

(*iii*) To increase industrial production by about 50 per cent.

(*iv*) The level of imports of industrial raw materials and spare parts of machinery will be substantially increased.

(*v*) To accelerate the economic growth of relatively less developed areas in East and West Pakistan.

An important feature of the Second Plan is that while the First Plan comprised two sectors namely public and private, in the Second Plan a third sector namely the semi-public sector has now been introduced. This sector includes public corporations, such as the Pakistan Industrial Development Corporation, the Pakistan International Airlines, the Karachi Port Trust, the Karachi Development Authority, the Inland Water Transport Authority of East Pakistan and the West Pakistan Road Transport Board. Liberal tax concessions to private industry and the Pakistan Industrial Development Corporation's policy of starting new factories and handing them over to private enterprise have encouraged private investments. For foreign industrial investment the Government guarantee foreign investors the right to repatriate capital and remit profits to the country of origin and also to hold the major portion of shares. To increase industrial production, reliance is placed essentially on private enterprise. The second plan suggests that if at any time private enterprise is found capable of undertaking any or all undertakings indicated in the Second Plan for public sector, the private sector will be allowed to do so.

Cotton mills: At the time of partition in 1947, Pakistan had 4824 looms and 175,000 spindles in 14 cotton mills. In 1961, Pakistan had 93 cotton mills with 30,000 looms and 1·9

million spindles. The industry gives employment to about 24,000 persons. The annual production of mill cloth is about 699 million yards against 235 million yards produced by handlooms. In spite of the fact that East Pakistan suffers from inadequate supplies of raw cotton and power, the great progress in the cotton textiles was made possible because of the enormous demand for the products. The moist climate, extensive system of water transport and efficient labour are other additional advantageous factors. The mill centres in East Pakistan are Khulna, Dacca, Bagerhat, Narayanganj and Kushtia. Six mills are in Narayanganj with 1787 looms and 41,852 spindles. From the view point of number of mills and production, the Dacca-Narayanganj is the main cotton textile area of East Pakistan.

In West Pakistan, the cotton mill centres are at Lyallpur, Lahore, Okara and Karachi.

The country has almost become self-sufficient in the coarse and medium varieties of cotton cloth. Import of cotton piece-goods, cotton twist and yarn declined sharply after 1953 with rapid increase in domestic production. The development of the cotton textile industry can be indicated by the rapid increase in domestic mill consumption of cotton and the decrease in the export of raw cotton as shown in the table below:

(In '000 tons)

Year	Production	Consumption by local mills	Exports of raw cotton
1950	... 221	18	216
1951	... 264	27	220
1953	.. 319	59	282
1955	... 284	154	68
1959	... 309	—	154

The need for imported cotton textiles will, however, continue so long as the superior and cheaper varieties are not produced in the country. The future of cotton industry is full of promise, as Pakistan is a great producer of raw cotton and consumer of cloth. A new cotton mill at Chittagong with 12,400 spindles has started production. There are 500,000 handlooms which provide employment in rural areas.

The strength of Pakistan cotton textile industry lies in the fact that 60 per cent of her total looms are automatic compared to 82 per cent in the case of India.

LOOMS AS ON JANUARY 1960

No. of looms	30,000
No. of ordinary looms	11,934
No. of automatic looms	18,066
P.c. of automatic to total looms ...	60·2

It may be mentioned in this connection that the production of fine and superfine varieties of cotton goods is still inadequate in Pakistan. Pakistan imports superior cotton textiles mostly from the United Kingdom, though low-grade Japanese textiles are also in great demand for their low prices.

PRODUCTION OF COTTON TEXTILES IN PAKISTAN

	yarn (000 lbs)	cloth (000 yds)
1957	315,873	527,048
1960	408,709	628,795
1961	412,603	699,035

Sugar Industry : Fourteen sugar factories in Pakistan are distributed as follows: —

Regions	No. of factories	Centres
East Pakistan ...	8	Rajshahi, Mymensingh, Dinajpur, Jessore, Thakurgaon, Rangpur.
West Pakistan ...	6	Rawalpindi, Abbotabad, Mardan, Jauharabad and Charsadda.

The production of *gur* is about 1·5 million tons. The annual production of sugar is a little more than 85,000 tons, against the annual consumption of 300,000 tons. East Pakistan can increase her production of sugar-cane in Mymensingh, Chittagong, Dinajpur and Rangpur where the soil and climate are favourable for this crop. The main problem, however, is the scattered nature of sugar cane areas which necessitates quick

transport to mill areas. Unless transport difficulties are overcome, the sugar industry will not be able to increase production in East Pakistan. A sugar factory at *Mardan* in the Peshawar division of West Pakistan, the biggest of its kind in Asia, has started operation from 1950. The factory has a total daily capacity of 1,500 tons. It is a great step towards making Pakistan self-sufficient in sugar.

The Woollen Industry : For centuries the production of wool has been one of the principal occupations of millions of people in West Pakistan, and even today the livelihood of many tribes in Baluchistan and the North-West Frontier Province depends almost entirely on this industry. In 1958, Pakistan had fifteen woollen mills with 19,600 worsted and 13,700 woollen spindles, and had thus become not only independent of imports of woollen and worsted manufactures but was also able to undertake some exports. Tweeds, rugs, carpets and blankets are being manufactured in West Pakistan. There is a factory at Karachi for the manufacture of yarn and worsted yarn. Pakistan's blanket industry consumes about half the raw wool production of the country. The Pakistan Government has recently started two woollen mills with 2,000-spindle capacity each at Hannai in Baluchistan region and Bannu in North-Western region of West Pakistan. The first woollen mill in East Pakistan will be located at Chittagong.

Match, Cement and Glass Factories : There are seven *match factories* located at Lahore and Dacca. Of the three factories in Lahore, two are owned by the Western India Match Company. The Lahore factories employ about 500 workers recruited locally from Lahore and its surrounding villages. Besides Dacca in East Pakistan, there are small match factories at Sylhet, Comilla, Rajshahi, Chittagong, Khulna and Bogra. In East Pakistan, match wood is available in sufficient quantities to permit further expansion of the industry. In 1961, Pakistan produced 9,831,000 gross boxes of safety matches. The *cement industry* is well organised. The Pakistan Industrial Development Corporation has set up two more cement factories with annual capacities of 100,000 tons and 240,000 tons respectively. These factories will raise the capacity of the cement industry to one million tons per year. At present there are five cement factories—4 in West Pakistan and 1 in East Pakistan. The centres are Wah (in the

Attock District), Karachi and Sylhet. The factory at Wah belongs to the Associated Cement Companies and employs about 1,500 workers recruited mostly from the adjoining villages. The Associated Companies also own the cement factory at Rohri in the Sukkur district of Sind Valley. The production of cement at Chatak (Sylhet) has gone up by 100 per cent recently.

Pakistan raised 1·2 million tons of cement in 1961 compared to 324,000 tons in 1948. The production reached one million ton level in 1957.

GEOGRAPHICAL DISTRIBUTION OF PRODUCTION OF CEMENT

(in '000 tons)

1958

Karachi ...	...	160	Hyderabad	...	240
Dandot (Punjab)	...	75	Dandkhel	...	100
Rohri (Sind)	...	90		...	——
Wah (Punjab)	...	225	—		940
Chatak (E. Pakistan)	...	50		...	——

The production of cement in Pakistan in 1962 was about 1·3 million tons, of which 50 per cent is required for domestic consumption. The *glass industry* is of recent growth. There are ten factories—seven in East Pakistan and three in the West Pakistan. Dacca is the chief centre of glass manufacture in East Pakistan.

Jute Mills : Although Pakistan had not a single jute mill in 1947 there are now eleven *jute mills* mostly located in Khulna, Chittagong and Narayangunj. In jute manufacture, the country is not only self-sufficient, but is also exporting.

PRODUCTION OF JUTE

(In thousand tons)

Year			Production	Export
1957	...	...	148·8	89
1958	...	...	172·1	114
1959	...	...	232·7	186
1960	...	...	264·7	188
1961	...	...	250·4	202

Pakistan has more than 7,000 looms with a total capacity of producing 2 lakh tons of jute goods per year. Production has already reached more than the level of 10,000 tons per month and Pakistan has increased the installed capacity to 12,000 looms in 1960. About 50,000 people are employed in the jute industry. The Export Bonus scheme now operating in Pakistan has put the Jute industry in a very favourable position *vis-a-vis* Indian jute in foreign markets.

Seventy per cent of the production of jute goods in Pakistan consists of sackings, while hessian and miscellaneous goods account for 25 and 5 per cent respectively.

VARIETYWISE EXPORTS

(In '000 tons)

Year	Hessian	Sacking	Total including others
1957	... 37	106	148·8
1958	.. 43	120	172·0
1959	... 59	161	232·6
1960	... 69	184	264·6
1961	... 67	169	250·3

The rise in the exports of hessian from Pakistan has been occasioned by the expansion in world demand for hessian. In the case of sackings, however, Pakistan has made heavy inroads into the traditional export markets of India. Exports of sackings from India declined from 422·9 thousand tons in 1957 to 279·2 thousand tons in 1961 while during the same period Pakistan increased its exports of sackings from 106 thousand tons to 169 thousand tons.

Pakistan ranks today second only to India as a manufacturer of jute goods in the world, accounting for 15 p.c. of the world production. The rise in production is due to the fact that Pakistan mills work two and a half shifts, thus making effective loomage to 22,000 from 8,726 looms. Since the internal demand has remained more or less the same, the volume of export is on the increase.

The supplies of chemicals and other raw materials are considerable for the development of *paper industry*. Resin, salt and lime of West Pakistan and the large quantities of bamboo in East Pakistan can help the location of paper industry. A big paper mill has been set up at Kaptaimuk, halfway between Chittagong and Rangamati, as the surrounding region is very rich in bamboo resources. This mill—the Karnafuli Paper Mill —operated by the Pakistan Industrial Development Corporation, came into production in 1953 using 75 per cent indigenous pulp. It is now producing about 100 tons a day. Straw-board and cheap wrapping paper can be manufactured in Karachi. Paper production reached 25,000 tons in 1959. A newsprint mill at Khulna with a capacity of 30,000 tons started production in 1959. A new high-grade Board mill at Nowshera and a Straw Board mill at Rahwali in West Pakistan have started production.

PRODUCTION OF PAPER AND BOARD IN PAKISTAN

(In tons) 1961-62

	West Pakistan	East Pakistan
Straw	4,664	—
Paper	11,152	—
Chip	2,090	—
Printing paper ...	—	18,651
Writing paper ...	—	5,971
Packing paper ...	—	7,303
Newsprint ...	—	28,800

Facilities of Transplantation

Pakistan has means of expanding transportation by land, air and water. Since the country is an agricultural one and has large surpluses of products for export, transport systems will always play a vital part in Pakistan's economy.

Railways : In Pakistan there are 6,994 miles of railway lines. The railway system, in West Pakistan, was originally designed primarily for strategic purposes and also for the transport of agricultural produce from the irrigation areas of N.W.F.P.,

Punjab and Sind to Bombay, Delhi and Karachi. The railways in East Pakistan also had the main objective of supplying the raw materials, e.g., jute to Calcutta. The railway system is now being rearranged to meet the changed conditions. Not only is there a lack of coal* in the country, but rolling stock is also in short supply. The main difficulties of the Pakistan railways at the time of partition were:

(*a*) shortage of trained technical staff;

(*b*) lack of suitable workshops and repair facilities in East Pakistan;

(*c*) uncertainty in respect of coal;

(*d*) shortage of locomotives, wagons and carriages.

In consequence, only about 120 miles of new railway lines were opened till 1959 in East and West Pakistan. The Government is making *Saidpur* workshop fully equipped. Another workshop has been set up at Pahartali.

Pakistan has two railway systems—the Pakistan Western Railway and Pakistan Eastern Railway.

The P. W. Rly. has its headquarters at Lahore. It has 5,344 miles of line with 4,500 miles of broad gauge. There are two main lines with several branches:

(*a*) Lahore to Peshawar *via* Wazirabad, Rawalpindi and Attock. The distance of the line is 238 miles. From Wazirabad a line goes to Sialkot on the border of Kashmir.

(*b*) Lahore to Karachi *via* Khanewal, Lodhram, Rohri and Sukkur. The length of the route is about 800 miles. The line crosses the Indus at Rohri. From Sukkur a branch line goes to Zahidan *via* Sibi and to Chaman *via* Quetta.

There are also other branch lines which connect Wazirabad

* The position in respect of coal is causing anxieties. "A programme of conversion of locomotives to oil burning is in hand. 172 locomotives have already been converted and the intention is to convert at least 50 per cent of the existing fleet of locomotives on N. W. Ry. as soon as availability of raw material permits" (vide Government of Pakistan—Transport and Industry by the Ministry of Industries).

with Khanewal; Peshawar with Muzaffargarh; Rohri with Badin. The P. W. Ry. has 747 stations.

The main economic role of the P. W. Ry. before the partition was to carry the agricultural produce of the Indus valley to Karachi and to distribute the imported goods from Karachi to the hinterland. With the development of industries in different areas of West Pakistan, the P. W. Ry. is playing a great significant role for internal trade as well.

In East Pakistan with 1,702 miles of line, there are two distinct systems of railway—broad gauge and metre gauge. The Brahmaputra divides the country into two parts. On the right bank of the river the railway consist of broad gauge track, which is mostly single-line, and a relatively small mileage of single-line metre gauge. On the left bank of the river the country is served by a metre gauge single-line track with Chittagong as the terminus. There is no direct connection between the two systems except by river transport. Though tea and jute are mostly carried by boats and steamers, the railways in East Pakistan have to handle a large volume of traffic in other commodities. The main railway lines of the P. E. Rly. run from Chittagong in metre gauge; (*a*) Sylhet *via* Laksam, Comilla, Narayanpur and Kulaura; from Laksam, there is a branch line to Chandpur; (*b*) to Bahadurabad *via* Narayangunj and Mymensingh. Mymensingh is connected by a line with Dacca. There is now much congestion of traffic in the line between Chittagong and Bhairab Bazar. Now that most of the trade of East Pakistan passes through Chittagong, there is a proposal to double the line along the system to cope with the increased and increasing traffic. Poradah is an important railway junction of the broad gauge lines. From here lines go to (*a*) Serajgunj on the Jumna in Pabna; (*b*) Rajbari on the Padma and thence to Faridpur; (*c*) Domar *via* Iswardi and thence to Darjeeling. "With the development of Chittagong and consequent change in the pattern of traffic, the maintenance of broad gauge in this area is expected to become uneconomic. In order to introduce rationalisation, reduce the cost of maintenance and avoid the break of gauge at various points in the country, the Railway Department has been examining the possibility of converting this line to metre gauge." There are 395 stations in the P. E. Rly.

Road Transport in the modern sense of the term is highly developed in West Pakistan, where there are metalled roads consisting of main and trunks. In East Pakistan, however, heavy rainfall, and existence of numerous rivers make road construction difficult and expensive. It has been estimated that for every one mile of road in East Pakistan as many as fifty minor bridges are to be constructed. There are no trunk roads in East Pakistan. The total mileage of roads in Pakistan is 70,000 of which 26,000 miles are of superior type. Superior surface roads are mostly confined to former West Punjab and N.W.F.P. East Pakistan has only 1,600 miles of metalled roads.

The roads are the responsibility of the provinces but the Central Government's policy is to stimulate road development by financial allocations from the Central Road Fund, by development loans and by grants.

Some important roads in Pakistan:

(*a*) Grand Trunk road from Landikotal near Khyber Pass to Wagah on the Indo-Pakistan border through Peshawar, Rawalpindi and Lahore.

(*b*) Trunk roads from Karachi to Lahore and Lahore to Quetta.

(*c*) Inter-provincial roads from Peshawar (N.W.F.P.) to Bostan (Baluchistan), from Karachi to Quetta and from Dera Ismail Khan to Shikarpur.

Frontier roads :

There are five main land-routes which connect Pakistan with Iran, Afghanistan and Sinkiang:

(*a*) From Chaman (in Baluchistan) along the Khojak Pass to Kandahar and Herat.

(*b*) From Quetta to Zahidan on the Iran-Baluchistan border by a branch line of the P. W. Railway; thence by caravan route to Iran. Of late, regular motorable roads have been opened connecting Zahidan with Teheran *via* Bam, Kerman, Yezd, Ardistan and Kasan.

(*c*) From Peshawar along the Khyber Pass (3,370 ft.) to Kabul and Jalalabad. The distance between

Peshawar and Kabul is about 170 miles. The Khyber Pass is only 30 miles long.* This is the only outlet to Afghanistan from Western Pakistan. This is the route by which Alexander the Great, Timurlane, Chenghis Khan, Nadir Shah and others invaded India. The route has followed the Kabul river. From Peshawar to Landikhana—a distance of 55 miles—the road lies far to the south of the river.

(*d*) From Attock to Kashgar (Sinkiang) *via* Chitral and Hindukush. It takes 12 days' hard tracking to reach Gilgit. There is also a 350 miles caravan route from Peshawar to Gilgit in the high Karakoram over Babusar Pass (13,700 feet). From Gilgit a branch route goes south-east 100 miles up the Indus to Skardu, the capital of Baltistan. Gilgit is the centre of an age-old caravan traffic from Sinkiang. From Kashgar, the traders bring silk, cotton cloth, carpet, sheep skin and goats to exchange for kerosene, sugar, matches and salt. The Peshawar-Gilgit route has been widened recently by the Pakistan Government so that motor lorries can traverse the whole distance within 4 days.

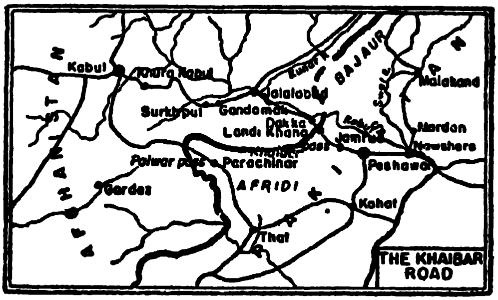


FIG. 90

(*e*) From Dera Ismail Khan along the Gomal Pass (7,500 ft.) to Kalat and Kandahar. The Gomal Pass as a trade route is the oldest of all trade routes in the Indo-Pakistan sub-continent. From the plains of Afghanistan every year thousands of traders with caravans enter the sub-continent down the Gomal. The

*** Alternative to Khyber Pass Trade Route.**

The possibility of the development of an alternative trade route to the existing highly expensive motor lorry road over Khyber Pass is envisaged in construction of Pakistan's Warsak hydro-elecric station.

The dam will result in penning up the water of the Kabul River and make this stretch of the river navigable. This part of the river could also be used as a water reservoir for fisheries.

The Kabul River canal will also enable afforestation to be carried out over large areas on the lower slopes of the Peshawar hills. These forests will ease the problem of fuel shortage in Peshawar, while employment in forests will absorb a further number of tribesmen.

traders bring camel-loads of silk and fruits, bales of camel and goat hair, sheepskins and carpets from Kabul and Bokhara.

Inland Water Transport : The inland waterways of Pakistan serve 5,000 miles of route. The rivers of West Pakistan are little used for transport. Though the Indus is one of the greatest waterways of the world, it has ceased to carry traffic since the railway traversed its valley and prevented inland water transport from becoming a competitor. Also, the irrigation projects draw heavily on the waters of the Indus.

The *Indus* rises on the north side of the Kailash range, near the source of the Sutlej. The Indus flows first north-west through Ladak between the Kailash and the main Himalayan range up to Gilgit, from where it takes a sharp bend towards the south and maintains this direction for the rest of its course. Near its mouth the Indus divides into distributaries "which form intricate channels across its reed-covered delta, fringed with mangrove swamps". In its upper and middle course, the Indus receives the waters of the *Shyok, Kabul, Kuram* and *Gomal.* But the most important tributaries are the *Jhelum, Ravi, Chenub* and *Sutlej*—all flowing from the western Himalayas and joining the Indus at Mithunkot. These four great tributaries, with the Indus itself, give their name to the Punjab —that is, the "Five Waters".

The right-bank tributaries (e.g., the Shyok, the Gilgit, the Kabul, and the Gomal) have no plain stage as they enter close to the mountains. The left bank tributaries, on the other hand, have a long course through the plains, and are therefore much more important both for navigation and irrigation.

The Indus is 1,800 miles long and is navigable for 1,000 miles from its mouth. The shifting character of its banks and sudden floods during the rainy season are responsible for the absence of important towns on its course. It is interesting to note that Multan, Lahore, Lyallpur. Wazirabad and Bahawalpur are situated not on the main stream but on its tributaries.

In East Pakistan, river navigation with about 3,000 miles of route occupies a very important place. There is no other region in the world which has so many navigable rivers, distributaries, channels and creeks as in East Pakistan. In East Pakistan, the transport of goods and passengers by water is the

principal means of communication. About 75 per cent of the total traffic of East Pakistan is handled by waterways.

The chief rivers of East Pakistan are the Padma, the Brahmaputra and the Meghna. The *Padma* is really the continuation of the Ganga. It flows towards the south-east from the Murshidabad-Maldah districts through Rajshahi, Pabna, Faridpur and Dacca. The Ganga divides itself into two parts near Maldah, one part flowing towards the south as the Bhagirathi and the other towards the south-east as the Padma. The *Brahmaputra* from Assam enters East Pakistan in Rangpur and flows towards the south and joins the Padma near Faridpur. The *Meghna*, known as the *Surma* in Sylhet, meets the *Padma* near Chandpur.

Regular steamer services are maintained between (*a*) Chand pur and Narayanganj; (*b*) Goalundo and Chandpur; (*c*) Goalundo and Narayangunj; (*d*) Dacca and Barisal; (*e*) Barisal and Lohajang. These services are essential not only for passengers but also for the movement of jute and rice of Pakistan.

There is, however, one difficulty in transporting goods by water between the interior parts of East Pakistan and the port of Chittagong. The river steamers cannot cross open water in the Bay of Bengal.

Civil Aviation : It maintains swift communication between the two parts of the country awkwardly divided by the great land mass of the Indian Union.

Pakistan is to-day supplied with airports and aerodromes in many parts of the country and is in a position to meet the expansion of aviation. The important aerodromes are at Karachi, Lahore, Quetta, Peshawar, Hyderabad, Multan, Dacca, Chitta gong and Sylhet. They also operate services to Bombay, Calcutta and Delhi in the Indian Union as well as to Ceylon, Burma, Singapore, Teheran, Cairo, London and Kabul.

Karachi is the principal international airport in the country and forms a gateway between Europe and the Far East. Its position on the international trunk routes has made it very important. Dacca airport is being developed to international standards and several international air-lines are already operating at this aerodrome.

Dacca is the centre of air services operating in East Pakistan. Chittagong is also recognised as an international airport.

The Pakistan air-line service with the Indian Union is being operated under agreement with the Indian Government.

In January 1955, the nationalisation of all air-lines took place, and the new concern is known as Pakistan International Airlines Corporation. It may be mentioned that several international airlines operate through Karachi. Some of the major airlines are British Overseas Airways Corporation, Pan American Airways, Air France. Indian Airlines Corporation and Royal Dutch Airlines.

Ports and Trade Centres

Pakistan has access to the Arabian Sea and the Bay of Bengal. The two important ports are Karachi and Chittagong.

Karachi. Karachi is the most important port of Pakistan. It is provided with a splendid natural harbour. Its hinterland is very extensive covering as it does not only the whole of West Pakistan but also Iran and Afghanisthan. Karachi is situated in the triangular Bay of Karachi which is separated from the mainland to the rocky headland of Manora. The American civil war, the opening of the Suez Canal in 1867 and the establishment of a direct railway line to the Punjab in 1878 led to the development of Karachi as a great wheat and cotton export centre. For long, its expansion was held up because of the greater shipping facilities in Bombay and the industrial backwardness of the Karachi Hinterland. The port of Karachi covers an area of $2\frac{1}{2}$ square miles. The principal exports are wheat, oil seeds, cotton, wool, hides and bones. The imports are cotton manufactures, sugar, metals, machinery, oil, woollen

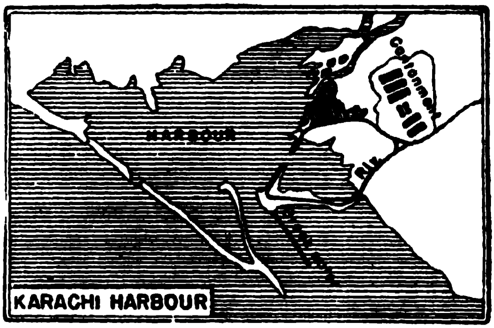


FIG. 91

manufactures, liquor, chemicals, etc. Karachi is more noted for commerce than for industries. Karachi is connected with its hinterland by the Pakistan Western Railway.

A striking increase in the volume of tonnage handled by the port of Karachi has been recorded during the past sixteen years, ever since the birth of Pakistan. Though exports have declined during the period, imports have nevertheless risen and the gross turnover of tonnage has progressively increased.

TONNAGE OF CARGO BY KARACHI

(in '000 tons)

Year		Imports	Exports	Total
1947-48	...	1,156	1,027	2,183
1951-52	.	2,622	1,155	3,777
1955-56	...	2,568	1,103	4,671
1956-57	.	3,012	1,040	4,052
1959-60	.	-		4,000

To increase the capacity of the port still further by 34 per cent to 50 per cent, the Karachi Port Trust has a scheme under consideration to undertake an improved lay-out of the 17 berths of the East Wharves which are constructed of wooden decking and need rebuilding. The Karachi Port Authorities have also helped industry by the lease of plots of land served by rail and road to various industrial concerns. The Government is considering the construction of a fishermen's harbour with a boat and ship yard, served by road and rail, and space for boats, drying of nets, refrigeration, canning and other developments. In 1958, a new dry dock was opened to accommodate cargo ship, oil tankers and passenger ships.

Karachi has a population of about 1·6 millions on the basis of the latest census.

Pasni, about 300 miles West of Karachi, is likely to become a port of importance in future in as much as it has a natural harbour and is connected by rail with Quetta and other places. Kedi Bandar, Shah Bandar and Sokhi Bandar are other minor ports of West Pakistan.

Chittagong is an important outlet for the produce of East Pakistan.* It is situated at a distance of 11 miles from the mouth of the Karnafuli river. The problem of silting in the Karnafuli is being tackled. The chief article of export is tea. The other exports are jute, hides and skins, rice and raw cotton. The imports are chemicals, machinery, metal, salt, cotton goods and sundry instruments.

During the last three years there has been a steady increase in the handling capacity of Chittagong. At the time of partition the port could handle only 600,000 tons of goods a year. Capacity has now been raised to over 3 million tons on the most urgent needs.

TONNAGE HANDLED BY CHITTAGONG

		Import	Export	Total
1947-48	...	263,721	157,124	420,845
1949-50	..	709,980	298,383	1,008,363
1952-53	...	1.213,004	490,103	1,703,107
1954-55	...	912,853	502,962	1,415,815
1955-56	..	1,040,206	563,137	1,603,343
1959-60	...		-	2,001,000
1960-61	..	—	-	3,300,000
1961-62	...		-	3.590,000

The Government has schemes for the development of the port in respect of harbour equipment and accommodation which will further increase its capacity to 4,000,000 tons. The development of Chittagong port has been given very high priority in the Pakistan Government's six-year plan, which is one of the projects associated with the Colombo Plan. The population of Chittagong is 200,000.

* At the time of partition, Chittagong was a small port having a frontage of about 2,300 feet which could berth only 4 ships at a time and handle half a million cargo. The port is now capable of handling over 3 million tons of cargo and can berth 22 ships at a time.

Side by side with the development of Chittagong port, the Government of Pakistan has opened at *Chalna* (district Khulna) on the river Pusoar, an inland port to handle ocean-going vessels. The location of the new port is about 80 miles from the sea and 2 miles from Chalna. The new port has relieved both the Chittagong port and the Eastern Pakistan Railway of pressure of traffic. It handles outgoing jute and tea and incoming coal and food-grains. In 1959-60, the port handled 1·6 million tons of cargo.

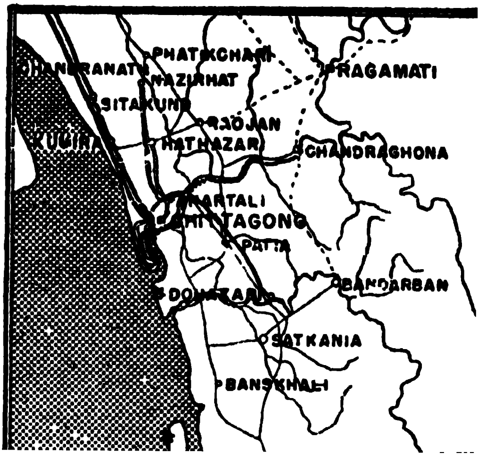


Fig. 92—Chittagong

From the point of view of value in exports, Chalna occupies the first place in Pakistan. In 1961-62, the value of exports from Chalna was Rs. 79 crores as against Rs. 52 crores from Karachi and Rs. 40 crores from Chittagong.

Tonnage Handled by Chalna

1951-52	248,000
1955-56	576,000
1956-57	746,000
1959-60	1,600,000

It will be observed that the position of Chalna with regard to tonnage in 1959-60 was the same as it was in the case of Chittagong in 1955-56. Chalna however cannot be a competitor of Chittagong as the hinterland of the former is handicapped by inadequate transport facilities.

The Pakistan Government also made surveys for finding suitable sites for new ports on the bank of the Haringhata and the Meghna. The Haringhata has a bar at its estuary which

makes it unsafe for vessels. The Meghna, on the other hand, is constantly shifting its course.

The other minor ports in East Pakistan are *Cox's Bazar* and *Noakhali.*

Trade Centres

There is a large number of towns with population of more than 100,000 in each in West Pakistan. The important towns are Lahore, Rawalpindi, Sialkot, Lyallpur, Multan, Karachi, Quetta, Jacobabad, and Hyderabad.

In 1959, it was decided to shift the capital from Karachi to an area on the Potwar plateau near *Rawalpindi. Lahore* is the largest city and the chief trading centre of Pakistan. It stands on the river Ravi and is 33 miles distant from Amritsar. Cotton weaving, tanneries, glassworks, flour mills, sugar mills, etc. are the chief industries. Leather trade is important. According to the latest census the population is about one million.

Lyallpur, 87 miles south-west of Lahore, is the biggest wheat-exporting centre of West Pakistan.

Multan is a frontier town. It is an important collecting centre. It brings fruits, drugs, silk and spices from Afghanistan and passes them on to the East. It is connected by railways with Lahore and Karachi.

Abbottabad, with a population of 40,000, is a hill station on the border of Kashmir. Leather and stone works are carried on in the city on an extensive scale. Recently certain weaving and spinning mills have been established. *Peshawar* is an important military and trading centre.

In East Pakistan, the important towns are Dacca, Narayanganj, Mymensingh, Faridpur, Rangpur, Sylhet and Chandpur. The major industries are tea (with largest number of establishments), jute presses (with largest number of workers employed), followed by cotton spinning and weaving mills. Rice mills, like tea factories, are numerous but engage a less number of employees than gardens, railway and engineering workshops and sugar factories.

In East Pakistan there are 116 tea gardens, 84 rice mills, 21 general engineering establishments, 14 hosiery and knitting mills,

13 railway workshops, 13 cotton mills, 7 sugar factories, 7 glass works, 1 paper mill, 11 jute mills and a newsprint factory.

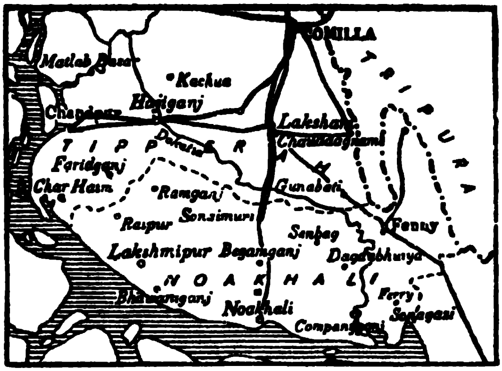


FIG. 93

Dacca is the capital of East Pakistan. It is situated on the Buriganga, a loop of the Dhaleswari, and extends along the bank of the river for about 4 miles. During the 17th century, it was the Mohammedan capital of Bengal and it lost its importance in 1704 when the capital was shifted to Murshidabad. Dacca is famous for shell bangles and for gold and silver craft. It is the most important inland trade centre. It is situated in the heart of the jute growing districts. *Narayanganj* is practically the port of Dacca. It is situated on the Lakhya river, a little above its junction with the Dhaleswari. It is a great jute emporium and has steamer services with Goalundo and Sylhet. It has a population of about 65,000. *Sylhet,* on the Surma river, is important for fruit and lime. The other centres are Faridpur. Mymensingh, Barisal and Noakhali.

Foreign Trade

Pakistan is not self-sufficient in many commodities required by modern industry. Coal, machinery, textiles, automobiles, chemicals, paper, iron and steel goods, sugar and rubber products are all used in large quantities by Pakistan industries or needed to fill the wants of Pakistan consumers. The maintenance of a large volume of trade is, therefore, of great importance. It is only by importing on a large scale that she can meet her needs for the many goods that cannot be produced in Pakistan.

The principal items of export are raw cotton, raw jute, raw wool, woollen manufactures, gypsum, potassium nitrate, raw hides and skins. Some foodgrains, tea, fruits and vegetables are also exported. Raw jute constituted the most important item of

export till recently. Of late, the attention has been given to the manufacture of jute within the country. Already, jute manufactures have been put in the foreign markets. The next item is raw cotton. About two-thirds of the cotton production are exported. The intense competition in the foreign market does not hold out much prospects of raw cotton export. Tea is the third major item of export, much of which is taken by U.K. The other important items are raw wool and hides and skins. Thus. "the dependence of the economy on the export of a limited number of raw materials is greatly vulnerable to changes in the world demand for these commodities." United Kingdom, Belgium, U.S.A., India, Italy, France, China and Australia are the chief destinations of Pakistan exports. Pakistan has barter deal with Indonesia, Czechoslovakia and Lebanon.

COMPOSITION OF EXPORTS AND THEIR VALUE, 1959-60

(in 1 million rupees)

Articles		Articles	
Raw Jute	782	Tea	35
Raw Cotton	207	Fish	47
Raw Wool	76	Value of Total Exports	1,843
Hides and Skins	82		

The chief items of imports are textile yarn and manufactures, mineral oils, machinery, steel and manufactures thereof, motor cars, chemicals, food, paper, electrical goods, etc. Her imports from India include cotton cloth and yarn, jute manufactures, sugar, gur, iron and steel, paper and coal. The volume of trade with India both in respect of imports and exports has considerably decreased within recent years.

TREND OF INDO-PAKISTAN TRADE

(In million rupees)

	Import from India	Export to India
1948	700	1,000
1959	63	55·1
1960	91	152

In 1960, of the total exports to India, jute accounted for Rs. 79 million and fish Rs. 32 million, of imports from India, coal accounted for one-third of the value in 1960.

U. K., Japan, China and Italy are the sellers of yarns to Pakistan. U. K., Japan, U. S. A., Italy, Iran, China, Ceylon and India are the main countries with which Pakistan has trade relations.

COMPOSITION OF IMPORTS: AND THEIR VALUE, 1959-60

(in 1 million rupees)

Cotton yarn and manufactures ..	21
Machinery	551
Iron and Steel . .	258
Vehicles	153
Oils	306
Chemicals etc. . .	141
Food grains	361
Total import	2,461

U.S.A. furnishes over 30 per cent of Pakistan's *overseas* imports and takes nearly 25 per cent of her exports. Japan is the major supplier of cotton goods to Pakistan. It is interesting to note that India which used to be the principal supplier of cotton goods to Pakistan yielded the place to U.K. "Should relations with India improve to the extent that cotton piece goods flow freely from that country again it is probable that she will once again become one of the most important—if not the most important—supplier to Pakistan, but it seems certain that Japan is now firmly established in the market". The imports from U.K. are machinery, metals and ores, textiles, instruments and apparatus, etc. The principal exports to U.K. are raw cotton, raw jute, tea, wool and hides and skins.

The diversification of its foreign trade has been the predominant feature of Pakistan's foreign trade policy. This was motivated by the desire to diversify the economy.

TOTAL FOREIGN TRADE OF PAKISTAN

(In million rupees)

	Imports		Exports	
	West Pakistan	East Pakistan	West Pakistan	East Pakistan
1950-51 ...	1167	453	1342	1211
1956-57 ..	1516	818	698	909
1961-62 ..	2236	873	543	1300

QUESTIONS

1. What are the chief mineral products of Pakistan and where are they obtained?

2. Describe the distribution of population in Pakistan and account as fully as you can for the facts you state.

3. Write a short account of the transport systems of Pakistan so as to emphasise their importance in the country.

4. On a sketch map of West Pakistan show the regions where irrigation has much developed.

5. On an outline map of East Pakistan,
   (a) shade the principal jute-growing areas;
   (b) indicate the main waterways with at least three river ports.

6. Write short notes on the following:- Lahore, Peshawar, Rawalpindi, Dacca and Narayanganj.

7. Describe the principal exports and imports of Karachi and Chittagong.

8. Examine the present position and the future prospects of the following industries in Pakistan: (a) Sugar industry; (b) Cotton mill industry; (c) Jute mill industry.

9. Discuss the nature of trade between Indian Union and Pakistan.

10. To what extent is Pakistan dependent on Indian Union for the supply of consumption goods? Are there alternative sources available now for such goods?

11. Describe the distribution of jute, cotton and wheat in Pakistan and relate their distribution to the geographical causes.

CHAPTER XVII

BURMA

In her racial type and culture, as well as in her geographical position, Burma belongs to the Indo-Chinese Peninsula.

Burma occupies the north-western and western parts of the great southward projection of the Indo-Chinese Peninsula. On the east lie the Chinese province of Yunnan, Indo-China and Thailand. To the north is the rugged region where India, China and Tibet meet. Burma presents the form of a kite, some 870 miles from north to south and 575 miles from west to east, *with a long tail extending to another 600 miles southward.* The coast-line is about 1,200 miles long and more broken than that of India.

Burma has an area of 261,789 square miles with a population of more than 20 millions. The average density of population in Burma is 72 per square mile as compared to 496 in Japan, 250 in China, 247 in India, 140 in Philippines and 103 in Malaya. In fact, Burma's density is lower than that of all other countries of South-East Asia. The highest densities in Burma are confined to the divisions of Pegu, Irrawady and Mandalay with 275, 215 and 153 per square mile. Pegu and Irrawady divisions have 2·9 and 2·7 million population followed by Tenasserim with 2·1, Sagaing 2·3, Mugwe 1·9, Mandalay 1·9, Arakan 1·2 and Eastern States 2 millions. Absence of large cities and the low proportion of flat and well-watered land are responsible for the low density in Burma.

The Burmans constitute roughly two-thirds of the total population. The Burmans are all Mongolians. The reason why the Burmans are so pure in race is that the country is shut off by mountains in the north-west, and by the Bay of Bengal in the west, from India. The Indian population is about 1 million. The Burmans are noted for their generosity, hospitality and enthusiasm. They are known as *"the Irish of the East who have won all hearts"*. The people of Burma are generally better off and better educated than others in the South-east Asia. They are open and frank, and they easily adapt them-

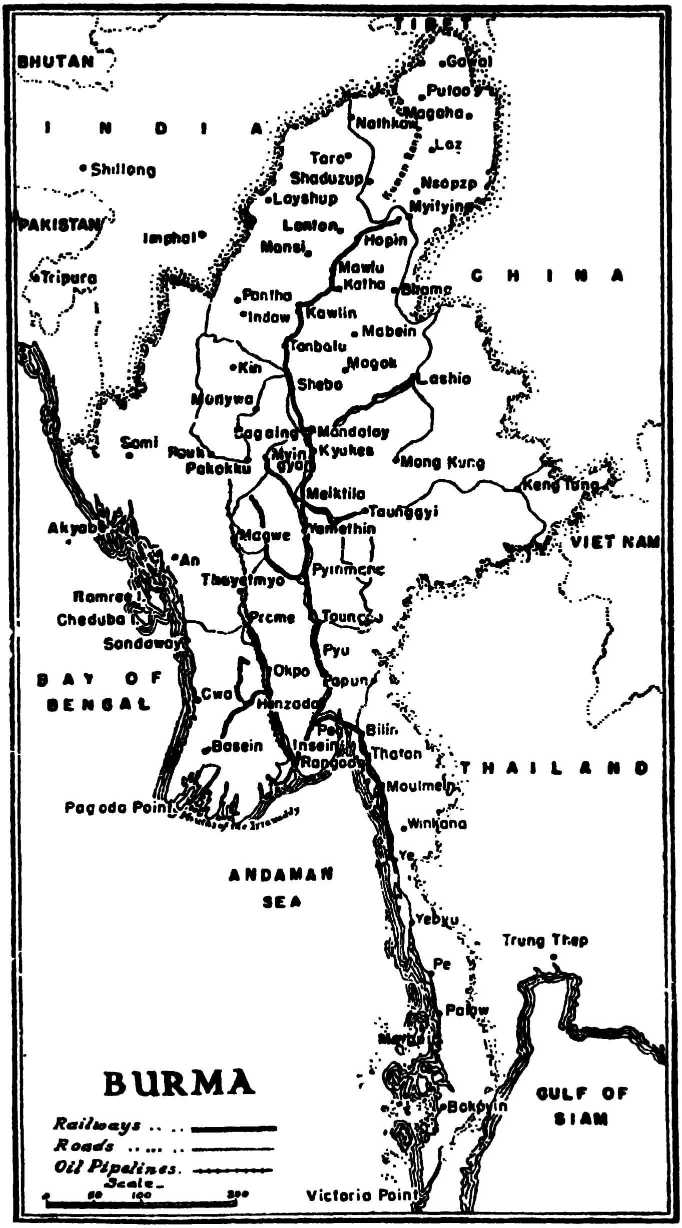


FIG. 94. The large size of the country with its sparse population and its industrial backwardness have created a problem of uniting the various regions by means of transportation.

selves to those with whom they come in contact. Men and women enjoy equal rights in society. The prevailing religion is Buddhism, which is professed by about 85 per cent of the population. The indigenous races of Burma are mainly of the Mongolian stock. There are three main divisions: (*i*) the Tibeto-Burman, (*ii*) the Mon-Khmr and (*iii*) The Tei-Chinese. They are more or less distantly related and connected ; although bitter at times, the assimilation and transformation of these races into a united nation has been steadily progressing for centuries.

It is a country of mountains and valleys. Northern Burma is a land of steep, lofty mountains and narrow valleys, all covered by forests. As the main ranges of mountains run from north to south, the communication between east and west is generally difficult. These mountain ranges become lower as they come south. Hence the transport conditions are better in the south. The valleys of the Irrawady and the Sittang comprise level lands of which alluvial soils have extended to the extreme south along the coast of the tail of Burma.

The greater part of Burma being within the tropics, the climate is hot and damp. The hottest months are April and May when there is almost no raintall. The monsoon breaks towards the latter part of May and continues almost daily until September. The delta and coastal areas are always very wet. There are three seasons in Upper Burma, cold, hot and wet ; but scarcely more than two in Lower Burma, wet and dry, both of them hot. The central districts of Upper Burma are dry. The areas are protected from the south-west monsoon by the Arakan Yomas. This is the only part of Burma where famine can occur.

The situation of Burma is very important: (*i*) She is a vital link in the air route from India to Australia. (*ii*) She has a common land frontier with Thailand, Indo-China and China. The *back doors* into China are Lashio, Taungyi and Maymyo ; the Lashio route, commonly known as the *Burma Road*, is very important. (*iii*) She is also connected with the main sea routes of the world.

Burma is an important source of many mineral products, like petroleum, lead, zinc, tin, tungsten, nickel and cobalt.

She is sixth in the world in lead, second to China in tungsten, fifth among world producers of tin and an important

producer of petroleum. Lead occurs in the eastern part of Burma, the Mergui district, the Putao district and the southernmost and northernmost extremities of Burma. The Bawdwin mine contains the largest and the richest deposit of lead. For many years Burma was the largest producer of tungsten mineral in the world. The tungsten deposits are widely distributed in Tennasserim area in the south and extend towards the north in Kyankse district. The country, however, has not so far developed important industries based on minerals, except for the petroleum refining industry The oil-fields were opened in 1887 by the Burma Oil Company. The oil-fields of Burma are confined to the valley of Chindwin and the Lower Irrawady. The main oil-field lies at Yenangyaung in Central Burma, and there is a pipe-line running to Rangoon. Another field of considerable importance is at Chauk in the Magwe district. Output of crude oil—just over one million metric tons annually before 1940—now amounts to about 500,000 tons a year. All the same, Burma's oil has political significance out of proportion to the quantity produced. Rich deposits of tin are found in Tennasserim. Bawdwin contains one of the largest deposits of silver in the world. Coal is found in the Chindwin valley where jade and amber mines are also worked. With the exception of a small output for a very limited period, from the Namma area in the Northern Shan States and from the Kabwet coalfields in the Shwebo district, there has never been production of coal in Burma. All coals used in Burma have been imported, chiefly from India. Burma, however, has reserves of tertiary coal in Chindwins, Mergui, Myitkyina and Shan States. All the tertiary coals of Burma are of a lignite type, and they disintegrate into small fragments on exposure to air. For this reason, the indigenous coal is not yet important. The other minor minerals are rubies and wolfram, antimony, and salt. Exports of minerals are approximately equal to their production.

The forests of Burma cover nearly 60 per cent of the total area of the country. There are six types of forests in Burma:

I. Tidal forest along the Arakan and Tenasserim coasts.

II. Beach and dune forests above the high-tide limits of the Arakan and Tenasserim coast.

III. Tropical evergreen forests, where rainfall is over 120 inches. Bamboo is the typical one.

IV. Mixed deciduous forests where the rainfall is 40 to 120 inches. Teak and Padauk are the chief types in Upper Burma.

V. Dry forests on the edge of the Dry Zone are a source of tanning materials.

VI. Sub-tropical and temperate forests are found on heights over 3,000 feet with pines, oaks, fern and chestnuts.

Teak has always been the most valuable tree commercially, while *bamboo* is probably the most useful forest product from the point of view of the people. Teak is found on the Pegu Yomas and the eastern slopes of the Arakan Yomas and also on the Siamese border. The teak trees are dragged by trained elephants from the forest to a river to be floated down to the Delta ports. In recent years about 75 per cent of the world's teak has come from Burma. Teak is unusually strong, durable and resisting to fungus. In 1960-61 Burma produced 312,000 round tons of teak. The other sources of timber are padauk, match wood and pyinkado, the production of which is 550,000 tons a year. Except teak, other timbers are not exported. Bamboo is put to several uses in Burma as household utènsils, weapons, furniture, for making rafts and water conduits. The canes are becoming important for chair and basket industry.

Burma is essentially an agricultural land. Nearly 71 per cent of the population are engaged in agriculture and forestry. Agriculture occupies about 20 million acres of land. Burma produces more than 6 million tons of rice annually. The heavy rainfall of Burma is peculiarly suited to rice which covers about four-sixths of the cultivated area. The Upper and Lower Irrawady valleys, the narrow coastal region on the west and upper Tenasserim utilise more than 80 per cent of their cultivated land for rice. Maize is cultivated in the central valley of the Irrawady. Sugarcane is cultivated in more than 20,000 acres of land in the Upper Irrawady region. The Northern Shan States raise tea. Although *tobacco* is cultivated throughout the country, the western regions are more important, particularly the Arakan hill tracts. Other crops are cotton and oil-seeds.

CROPS AND ACREAGE IN BURMA

(in '000 units)

	1958-59		1959-60	
	Acreage	Production	Acreage	Production
Rice ...	10,402	6,486	10,667	6,916
Millet ...	498	69	525	73
Pulses ...	1,183	211	1,249	211
Sesame ...	1,410	52	1,547	66
Sugarcane ...	88	1,040	93	1,100
Cotton ...	350	12	371	12
Groundnut ...	1,004	284	1,086	275

Waterways form the most important means of communication in Burma. All the three rivers of Burma flow nearly due south through narrow valleys. They have few tributaries, and yet they never run dry and are full and deep for most part of the year. The river *Irrawady* traverses the whole length of Upper and Lower Burma and is navigable from Rangoon for nearly 900 miles to Bhamo. It is the most important outlet of the heart of Burma, and the chief cities of the country are situated on its bank. The general course of Irrawady is nearly due south from the mountains to the sea, and it flows slowly. At Henzada, 100 miles from the coast, the Irrawady begins to give off distributaries, of which the Rangoon river is one. This river is deep enough for ocean steamers. The river is also connected by a creek across the delta with the main stream of Irrawady. *The Salwin*, though longer than Irrawady, is navigable only for 80 miles from its mouth. It is much interrupted by rocks and rapids. It has no delta. The river *Sittang* is not important as it is blocked by sand banks. Except in the monsoon, the river cannot be used for navigation.

The railways are all metre gauge and start from Rangoon. In 1959 Burma's railway mileage was 2,667. The main line of the railway follows the Sittang Valley from Rangoon to Mandalay through Pegu. Another main line runs from Rangoon to Prome along the valley of the Irrawady. The branch lines are as follows: (*i*) Pegu to Martaban with a ferry across the river to Moulmein; (*ii*) Moulmein to Ye and from Ye to Burma-Siam line; (*iii*) Mandalay to Lashio; (*iv*) Mandalay to Myitkyina; (*v*) Henzada (on the Prome route) to Bassein.

Being a country of waterways, roads are not properly developed in Burma. The cost of making metalled roads is high because of the scarcity of good stone and the high cost of labour. There are only 10,000 miles of roads, of which 3,760 miles are motorable. The principal roads are: (*i*) the Burma Road, (*ii*) the Rangoon-Prome-Yenangyaung-Meiktila, (*iii*) Myingyan-Meiktila-Taunggyi-Siam, (*iv*) Sagaing-Shavebo-Kalewa-Imphal, (*v*) the Stilwell Road, (*vi*) Pegu-Thaton-Moulmein-Tavoy and Margin.

The *Burma Road* runs from Rangoon to Kunming, *via* Pegu, Mandalay, Maymyo, Lashio and Wanting. This route is open in all weathers throughout the entire length. The *Stilwell Road* runs from the Assam rail head at *Ledo* to Bhamo *via* Myitkyina. From Bhamo there is a road to connect it with the Burma Road through Namkham. The Stilwell Road was built for military purposes, although it passes through rich agricultural lands of Hukawng Valley.

There are no regular land routes between India and Burma. "Burma has never had a road connected with India. Such a road could only have been built as a strategic road, as sea-freights would always be lower than the charges by land." The question of linking the road and railway systems of Burma and India may receive attention in near future.

There are only a few cities in Burma, most of which are modern. These cities are either sea-ports or river-ports. The principal trade centres are Akyab, Bassein, Tavoy, Moulmein, Mandalay, Bhamo and Rangoon. *Bhamo,* in Upper Burma, does considerable frontier trade with China. It is 200 miles above Mandalay. It owes its importance to its position. It is the terminus for the steamer traffic and is only 20 miles from China's frontier. *Akyab,* on the western coast of Burma, is an important rice-exporting centre. Its great draw-back is that it has no railway communication. It is now the third port of Burma and the centre of the trade of the fertile rice-bearing Arakan coast strip. It has a population of over 40,000. The principal imports are liquor, machinery, textiles and hardware. *Bassein,* on the south-west of the Irrawady Division is situated at a distance of nearly 70 miles from the sea. It has direct railway communication with Rangoon. *Rangoon,* the chief port of Burma, is the capital of the country. It is situated on the

Rangoon river and is about 25 miles from the sea. It owes its growth and importance almost entirely to its situation. It is the sea-outlet for the great delta and river-basin of the Irrawady. About 90 per cent of the foreign trade of Burma is handled by Rangoon. The principal imports are cotton manufactures, metals, provisions, silk, sugar, leather goods, machinery, paper, etc. The chief exports consist of rice, hides and skins, zinc, lead, timber, mineral oils, tobacco and rubber. It is connected by railways with the most important towns of the country. *Moulmein,* on the Gulf of Martaban, is a large port. It is connected by railways with Rangoon. From a mere fishing village in 1824, it has now become the second seaport of Burma. The opening of the railway line has increased its importance, and much of the former import traffic of Rangoon is to-day handled by Moulmein. The chief imports are steel, sugar, provisions and gunny bags; while the exports consist of timber, rubber, tin ore and tobacco. It is also the great teak port of Burma. Rafts of timber from wooded hills are allowed to float down the Salween up to Moulmein. *Tavoy* is situated in the centre of the tail of Burma and is an important port. Wolfram and tin are the principal exports. *Mergui,* on the south-west coast of Tennasserim, is the centre of rubber and pearl-fishing industries. *Mandalay,* in Upper Burma, is situated on the Irrawady river, about 400 miles north of Rangoon. Mandalay is favoured by its position in the broadest part of the Irrawady valley and at the haed of the valley of the Sittang. Rice and silk are the articles of trade in the city.

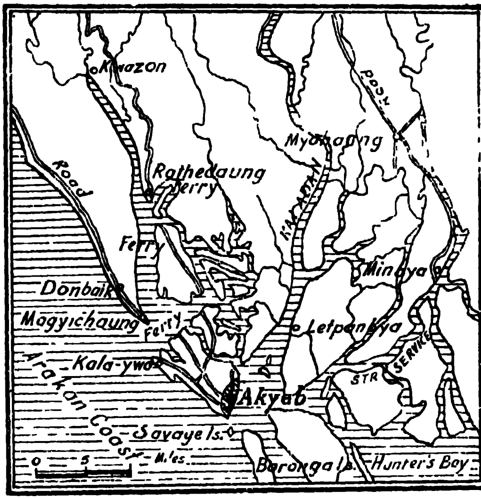


FIG. 95. Akyab

Normally Burma has a favourable balance of trade. Two-

has put 2·4 million acres of land under rice cultivation. Efforts are being made to increase also the yield per acre from 18 to 50

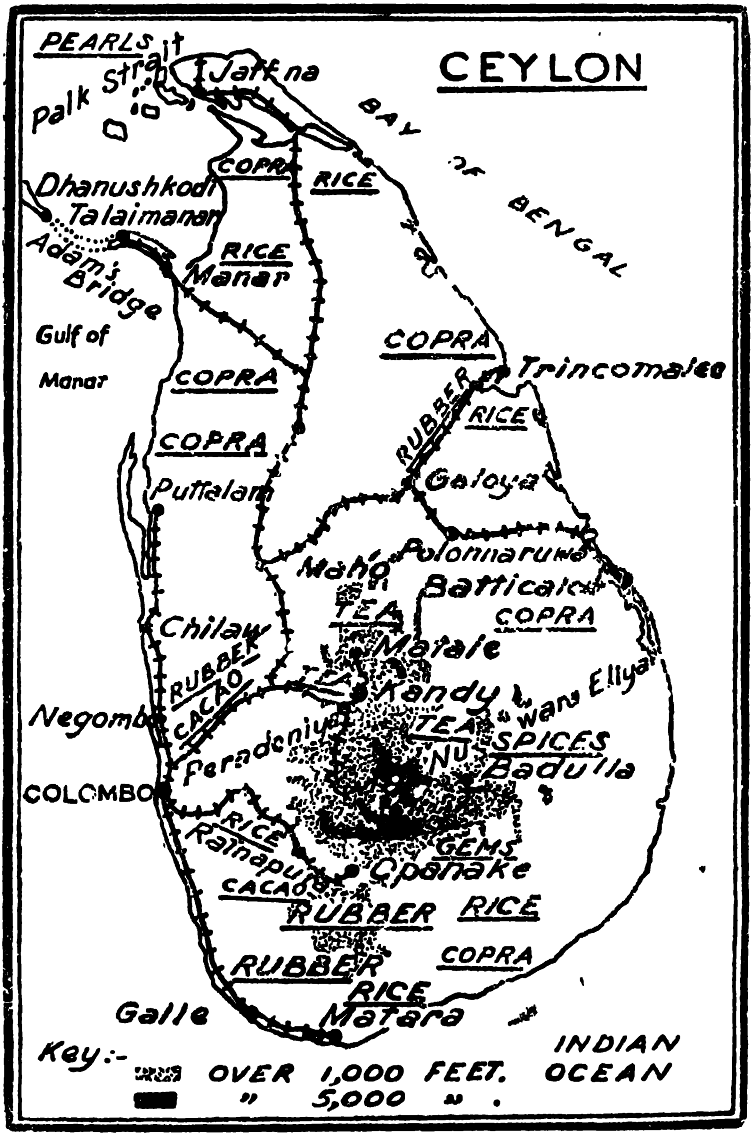


FIG. 96. Note the railway lines radiating from Colombo to Jaffna on the extreme north, Matara on the extreme south and Trincomalee on the north-east coast.

bushels of rice. With regard to rubber, Ceylon raises about 6 per cent of the world's total rubber. In 1959 the production of rubber in Ceylon was 92,000 tons. The economy of Ceylon is inextricably bound up with its plantation industries, in particular tea and rubber. It is interesting to note that the Government of Ceylon has decided to organise peasant tea colonies in order to double its tea export in the next 20 years. The colonies will range in extent from 2000 to 20,000 acres each, and each peasant will be allotted 2 acres. The tea will be manufactured in State-owned factories. There will be also State-owned estates and their tea will compete with the produce of privately owned estates.

Of the minerals, limestone, gems and graphite are important. The geologists have ruled out the possibility of finding coal deposits of commercial importance in Ceylon. All the coal used in the country is imported. In contrast to coal, the known iron ore of Ceylon is of good quality, and the prospect of future discovery is promising. The principal iron ore fields are situated in the south-western part of the island. It is proposed to establish a factory at Ragama, about 10 miles north-east of Colombo. Ceylon contributes about 11 per cent of world's total production of graphite. Her annual production of graphite is about 14,000 tons most of which is exported. Precious and semi-precious stones are found principally in the gravel of the Ratnapura district and the south-west part of the island. The most important stones are sapphire, ruby, topaz, spinel, garnet and moonstone.

The railways run from Colombo to the north-west to Talaimannar, to the north of Jaffna and to the east of Trincomalee.

Tea, rubber, copra and cocoanut oil are the chief items of export. Out of the total exports valued at Rs. 175 crores in 1959 the export of tea alone accounted for Rs. 104 crores. Cinnamon, tobacco, timber and cardamom are also exported. Ceylon derives about 30 per cent of its national income from exports. The country imports rice, petroleum, cotton goods, motor cars, metals, coal and cement.

The value of total imports in 1959 was Rs. 200 crores of which rice accounted for Rs. 28 crores, cotton piece-goods Rs. 18 crores, coal Rs. 1·5 crores, and sugar Rs. 7 crores.

India has always been playing a prominent part in Ceylon's foreign trade, though generally speaking, trade between the two countries is more competitive than complementary.* India sends cotton textiles, jute, pulses, fish, fruits, vegetables, rice, wood and timber. India can also export silk and woollen textiles, hosiery goods, blankets, carpets, and rugs, soaps, books and cutlery.

Indian imports from Ceylon are confined to cocoanut products, spices, rubber and seeds. At present the best customer of Ceylon is U.K. followed by India, Burma and U.S.A.

Recently Ceylon has been manufacturing acetic acid, ceramic, glass, glue, hats, plywood, quinine, paper and coir.

INDO-CEYLON TRADE

(in million rupees)

	1959	1960
Imports from India ...	222	185
Exports to India ...	61	39

There are good prospects for increasing trade relations with India in particular for the Indian goods like electric fans, sewing machines, telephone equipment, razor blades and other engineering goods. In October 1961, a trade agreement was made between the two countries in terms of which Ceylon will examine the possibility of importing larger quantities of cement, motor vehicles, railway equipment and telephone equipment from India.

Colombo, the capital of Ceylon, is a great entrepot port, occupying an important location in one of the principal highways of commerce between the East and the West. Its harbour is artificial, but a fine backwater encloses it. *Trincomalee,* on the north-east coast, is a port of minor importance. *Jaffna,* on the north, is an important town. *Kandy,* in the central highland, is the old capital.

* The importance of Ceylon's foreign trade to India has special significance by reason of the fact that Ceylon's economy, being essentially a plantation economy, is based, in the main, on just three important commodities—tea, rubber and cocoanuts—so that country is India's principal competitor in tea in world markets.

APPENDIX I

BASIC FACTS ABOUT INDIA

I. AREA AND PRODUCTION OF CROPS IN INDIA

	ACREAGE (in million acres)		PRODUCTION (in million tons)	
	1958-59	1960-61	1958-59	1960-61
Rice	81	83	30	34
Wheat	31	32	10	11
Jowar	43	42	9	9
Bajra	28	28	4	3
Barley .	8	8	3	3
Maize	10	11	3	4
Ragi	6	6	2	2
Small millets .	12	12	2	2
Total cereals	220	222	63	67
Gram	25	23	7	6
Tur ..	6	6	2	2
Other pulses ..	29	28	4	4
Total pulses .	59	58	12	12
Total foodgrains ...	280	280	76	79
Groundnuts ...	15	15	5	4
Rape and Mustard ...	6	7	1	1
Sesamum .	6	5	0·4	0·2
Castor	1	1	0·1	0·1
Linseed	4	4	0·5	0·4
Total oil seeds ...	31	33	7	7
Cotton (million bales)	20	19	5	5
Jute ,, ...	2	2	5	4
Mesta ,, ...	1	1	1	1
Sugar cane ...	5	6	7	9

II. ANNUAL AVERAGE YIELD PER ACRE

(in lbs.)

1958-59 to 1960 61

	Rice	Wheat	Maize	Gram	Sugar Cane	Cotton	Tobacco	Oilseeds
Andhra	1130	224	671	269	—	57	692	518
Assam	850	538	403	560	—	—	—	336
Bihar	747	408	680	402	3344	—	—	272
Maharashtra	850	413	840	299	6534	86	551	509
Kerala	1187	—	—	—	—	—	—	538
M.P.	731	395	824	543	—	71	—	318
Madras	1323	560	986	470	—	136	—	955
Mysore	1187	202	784	269	—	67	499	484
Orissa	627	560	358	246	—	—	—	274
Punjab	874	854	1024	716	3295	217	—	493
Rajasthan	874	506	830	550	—	—	—	210
U.P.	616	707	629	574	2541	—	698	44
West Bengal	1925	627	627	493	—	—	—	292
All India	850	716	771	515	3330	94	645	476

III. (a) RAW JUTE SUPPLIERS

(000 bales)

	1957-58	1960-61
Opening Stock ...	1,872	1 650
Production		
Raw Jute ...	4,052	4,030
Mesta ..	1,291	1,147
Import .	695	410
	7,910	7,237

III. (b) SUPPLY AND DISTRIBUTION OF COTTON IN INDIA IN 1960 61

(in 000 bales of 400 lbs. each)

	1959-60	1960-61
Supply		
Stock		
Indian Cotton ..	1,830	990
Foreign Cotton .	185	450
Production	5,810	5,438
Import .	1,000	980
	6,825	7,858
Distribution		
Indian Cotton		
Export . .	200	295
Mill Consumption	4,419	4,250
Foreign Cotton Consumption	686	1,153
Stock		
Indian .	1,035	1,814
Foreign	450	350
	7,825	7,858

III. (c) SOURCES OF IMPORT OF COTTON IN INDIA

(in bales of 400 lbs. each)

Varieties	1959-60	1960-61
American .	411,302	641,675
Sudan . .	128,353	84,109
Egyptian .	207,746	85,901
East Africa . .	170,448	147,492
Pakistan .. .	33,451	2,624
Other sorts	22,665	39,871
	973,965	1,001,672

III. (d) MILL CLOTH PRODUCTION IN INDIA

(in million yards)

	1959-60	1960-61
Coarse	893	705
Medium .. .	3,500	3,813
Fine ...	241	229
Super Fine .	291	301
Total	4,925	5,048

IV. QUANTITY AND VALUE OF MINERAL PRODUCED IN INDIA

	Unit of quantity	1958 Quantity	1958 Value (in thousand rupees)	1959 Quantity	1959 Value (in thousand rupees)
Metallic minerals					
Ferrous ...					
Chromite ..	metric tons	6,39,57	31,86	852,17	49,66
Iron ore ...	thousand metric tons	61,30	4,84,91	79,82	5,74,61
Manganese ore	—do—	12.76	11,55,28	11,87	9,48,39
Non-Ferrous					
Bauxite	metric tons	1,39,098	12,84	2,17,991	22,12
Copper ore .	metric tons	4,11,471	2,26,68	4,04,000	2,13,97
Gold* ...	kilograms	5,291	4,99,88	5,144	5,36,04
Ilmenite . .	metric tons	3,14,122	1,83,39	3,03,000	1,78,41
Lead (concentrates)	metric tons	5,341	19,37	6,088	23,18
Silver* ..	kilograms	3,416	5,78	3,841	6,61
Zinc (concentrates)	metric tons	7,391	20,49	9,978	25,94
Non-metallic minerals					
Diamond .	carats	1,540	4,30	6,82	2,26
Emerald .	thousand carats	80	50	2,49	90
Gypsum .	metric tons	7,94,392	52,15	8,60,000	62,47
Mica (crude) .	metric tons	31,942	2,53,01	28,846	2,43,76
Salt (other than rock) ..	thousand metric tons	42,28	8,43,35	31,74	5,98,10

* Value of metals given in the absence of the value of the ore.

V INDIAN LAC

(1) Production of Stick Lac in India, 1960 61
(in quintals)

	Areas	Per cent share to 1958	Total 1961
Bihar	241	31	48
Madhya Pradesh	179,902	42	34
West Bengal	47,215	12	9
Maharastra	23,888	7	4
U P	13,063		
Orissa	11 571		
Total India	327 950		

(2) Exports of All Kinds of Lac
(in quintals)

Countries	1958 59	1960 61
U S A	124 256	38 481
West Germany	32,289	33,460
U K	28 435	17,553
U S S R	19 288	14,133
China	9 916	
Total All India	266,368	274,060

(3) Percentage Share of Exports of Different Kinds of Lac

	1958 59	1960 61
Shellac	44 6	56 8
Seedlac	50 5	37 8
Other kinds	4 9	5 4

VI PRODUCTION OF COAL IN INDIA

Year	Production (lakh tons)
1868	5
1880	10
1890	22
1900	61
1910	1,20
1920	1,80
1930	2,38
1940	2,51
1946	2,60
1950	3,20
1955	3,82
1956	3,94
1957	4,35
1958	4,53
1959	4 70
1960	5,40 (app)

VII PRODUCTION OF MOTOR VEHICLES

India manufactured 53,661 Motor vehicles in 1961 and 52,115 in 1960 The following table gives the breakup of the various models manufactured by the various firms during these years

INDIA

	1960	1961
Hindustan Motors	16 296	15 152
Premier Automobiles	12 863	12 725
Tata Engineering & Locomotive Co	9 665	12 000
Ashok Leyland Ltd	2,084	2 371
Mahindra & Mahindra	6 930	80,004
Standard Motors	3 364	3 409
Total	52 115	53 661

Total number of automobiles manufactured in India in

1957	31 929
1958	26,788
1959	36,304
1960	52,115
1961	53,661

VIII. PLANTATION INDUSTRIES IN INDIA

Tea	Area under cultivation (thousand acres)	Production (thousand lbs.)
1947	7,66	56,17,40
1950	7,77	60,73,18
1955	7,91	67,83,71
1956	7,92	68,06,10
1957	7,99	68,51,37
1958	8,09	71,13,00
1959	8.09	69,57,00
1960	—	69,60,00
Coffee		
1947	2,15	3,49,71 (a)
1950	2,24	5,43,22
1955	2,53	5,86,53
1956	2,54	5,40,80
1957	2,60	8,80,10
1958	2,68	—
1959	—	10,05,76
Rubber		
1947	—	3,23,67
1950	1,44	3,18,29
1955	1,74	4,95,40
1956	1,84	4,90,00
1957	2,38	—
1958	2,73	—
1959	3,00	—
1960	3,11	—

IX. PRODUCTION OF CEMENT IN INDIA

Year	Production (thousand tons)
1914	1
1918	84
1930	5,63
1940	17,12
1947	14,47
1950	26,12
1955	44,87
1956	49,28
1957	56,02
1958	60,68
1959	68,14
1960	77,00

X. PRODUCTION OF PAPER AND PAPER-BOARD IN INDIA

Year	Production (thousand tons)
1950	1,09
1955	1,85
1956	1,93
1957	2,10
1958	2,53
1959	2,94
1960	3.40

XI. PRODUCTION OF NEWSPRINT IN INDIA

Year	Production (tons)
1955-56	3,455
1956-57	13,534
1957-58	14,145
1958-59	21,838
1959-60	22,411

XII. PRODUCTION OF IRON AND STEEL IN INDIA
(in thousand tons)

Year	Pig Iron	Finished Steel
1900	35	--
1916	—	99
1939	18,35	8,48
1941	—	11,38
1947	13,20	8,93
1950	15,62	10,04
1955	17,57	12,60
1956	18,07	13,38
1957	17,89	13,46
1958	20,03	13.00
1959	31,30	17,11
1960	41,62	22,15

XIII. PRODUCTION OF COTTON YARN AND CLOTH IN INDIA

Year	Cotton cloth (lakh yds.)	Cotton yarn (lakh lbs.)
1947	376,20	129,60
1950	366,70	117,48
1955	509,40	163,08
1956	530,66	167,12
1957	531,71	178,01
1958	492,70	168,54
1959	502,54	172,28
1960	501,40	171,00

XIV. PRODUCTION OF JUTE MANUFACTURES IN INDIA
(in thousand tons)

Year	Production*
1947	10,52
1950	8,36
1955	10,27
1956	10,93
1957	10,30
1958	10,62
1959	10,52
1960	10,67

XV. GROWTH OF SUGAR INDUSTRY IN INDIA

Year	Number of mills	Production of sugarcane (thousand tons)
1931-32	32	1,60
1938-39	132	6,42
1945-46	138	9,23
1950-51	139	11,16
1955-56	143	18,56
1956-57	166	20,39
1957-58		20,06
1959	--	20,84

* Figures for 1950 onwards relate to the production of mills in the membership of the Indian Jute Mills' Association and of one non-member mill.

XVI. REFINERIES IN INDIA

	Capacity (million tons)	
Burmah Shell Refinery	2·5	
Stanvac Refinery	1·6	
Caltex Refinery	0·675	
Digboi Refinery	0·40	
Gauhati Refinery (under construction)	0·75	
Barauni Refinery (under construction)	2·00	
Total	7·925	
Say	8	million tons

XVII. INDIAN FISH YIELD IN 1960

The fish yield in India in 1960 was the highest ever recorded. The sea fish catch was about 880,000 metric tons and the marketable surplus of inland landings, including estuarine tracts, about 280,000 tons. These together with subsistence fishing in small ponds put the total at well over 1·4 million tons, the Second Plan target.

XVIII. PROGRESS OF INDIAN SHIPPING

The Shipping Corporation of India Ltd. which is a Government of India undertaking has cargo services to U.K.-continent, Poland, U.S.S.R., Japan, Australia and U.S.A. It has also passenger services to East Africa, Malaya-Singapore and Andamans. In 1962-63, it had a fleet of 28 vessels of 296,535 DWT. and carried 1·1 million tons of cargo.

APPENDIX II

Basic Facts about Pakistan

I. AREA UNDER PRINCIPAL AGRICULTURAL CROPS

Current Estimates 1962-63, in 000 acres

	West Pakistan	East Pakistan	Total
Rice	2 899	20 110	[illegible],009
Bajra	1 965	1	1 966
Jowar	1 269	-	1 271
Maize	1 127	13	1 140
Sugar cane	1 064	317	1 381
Cotton	3 204	40	[illegible]244
Jute		1 72[illegible]	1 723

II. MINERAL PRODUCTION WEST PAKISTAN (1961)

(in tons)

Chromite	[illegible]5 103
Lime stone	1176 442
Gypsum	99 598
Fireclay	16 065
Silica sand	13 148
Ochres	406
Iron ore	3 804
Bauxite	405
Lead ore	62
Rock salt	198,021
Soap stone	1,215

III. PRODUCTION OF FUEL AND POWER IN PAKISTAN

1961

Natural Gas (000 cubic feet)	34 664,771
Coal (000 tons)	906
Crude Petroleum (000 I.G.)	99,030
Electric energy (000 kwh.)	1 818 929

IV. MANUFACTURING

(1) Cotton Textiles 1961

	Total yarn (000 lbs.)	Total cloth (000 yds.)
West Pakistan	361,314	629,663
East Pakistan	51,289	69,372
All Pakistan	412,603	699,035

(2) Art Silk and Rayon Cloth 1961
(000 yds.)

West Pakistan	25,673
East Pakistan	368
All Pakistan	26,041

(3) Paper and Board 1961
(in tons)

	West Pakistan	East Pakistan
Straw	4,664	
Paper	11,152	25,622
Packing paper		7,303
Newsprint		128,800

IV. Production of Cement 1961
(in 000 tons)

West Pakistan	1,127
East Pakistan	96
All Pakistan	1,223

V. TRANSPORT

Railways in 1961-62

	West Pakistan	East Pakistan
Freight carried (000 tons)	13,800	6,003
Passengers (in 000)	121,102	72,264

VI. LAND BORNE TRADE BY COUNTRIES
(1960-61—in 000 rupees)

	Export	Import
Afghanistan	20,793	33,576
Iran	2,200	8,586
India	101,022	93,691

APPENDIX III

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